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Amateur Radio

CQ

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On the cover: , Grand Prairie, TX

'S JOURNAL

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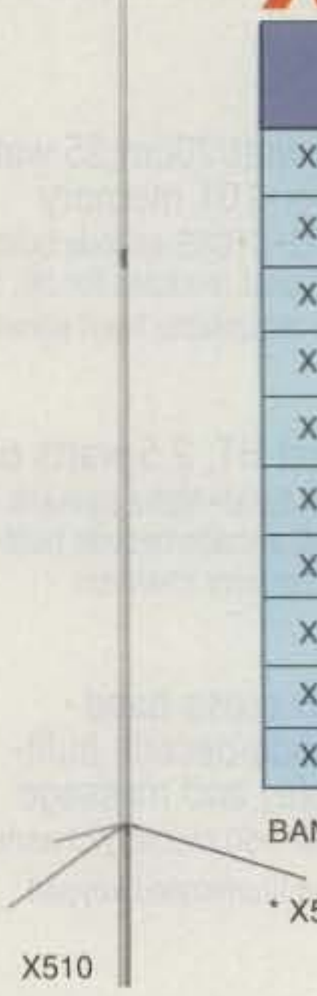
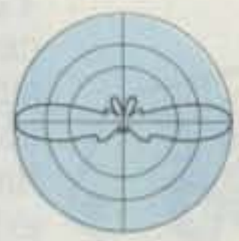
MODEL	BAND(MHz)	GAIN(dBd.)	WATTS	CONN.	HT. Ft.	RATED WIND/ MPH
X-50A	144/440	4.5/7.2	200	UHF	5.6	135
X-200A	144/440	6.0/8.0	200	UHF	8.3	112
X-300A	144/440	6.5/9.0	200	UHF	10.2	112
X-510NA	144/440	8.3/11.7	200	N	17.2	90
X-510MA	144/440	8.3/11.7	200	UHF	17.0	90
X-500HNA	144/440	8.3/11.7	200	N	17.8	90+
X-700HA	144/440	9.3/13.0	200	UHF	24.0	90
X-2200A	144/222	6.0/7.8	150	UHF	11.5	112
X-3200A	144/222/440	6.0/7.8/8:0	100/200	N	10.5	112
X-6000A	144/440/1240	6.5/9.0/10.0	100/100/60	N	10.5	112

BAND: 144=144 - 148MHz. 222=222 - 225MHz. 420=420 - 430MHz.
430=430 - 440MHz. 440=440 - 450MHz. 1240=1240 - 1300MHz.
* X510NJ :144 - 147 / 430 -440MHz



X510



147MHz

445MHz

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X-500HNA/X-500MA/X-510NA

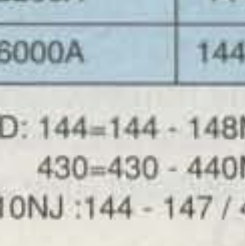
GH/F/U&V series

MODEL	BAND(MHz)	GAIN(dBd.)	WATTS	CONN.	HT. Ft.	RATED WIND MPH
DP-GH62	50	6.0	200	UHF	21.0	78
F-22A	144	6.7	200	UHF	10.5	112
F-23A	144	7.8	200	UHF	15.0	90
F-142A	222	5.5	200	UHF	6.0	110
F-718A*	440	11.5	250	N	15.0	110
F-1230A	1240	13.5	100	N	10.5	90
U-200A	440/1240	8.3/11.7	100	N	5.9	135
U-300A	440/1240	8.6/13.2	100	N	8.3	110
U-5000A	144/440/1240	4.5/8.3/11.7	100	N	5.9	135
V-2000A	50/144/440	2.1/6.2/8.4	150	UHF	8.3	110

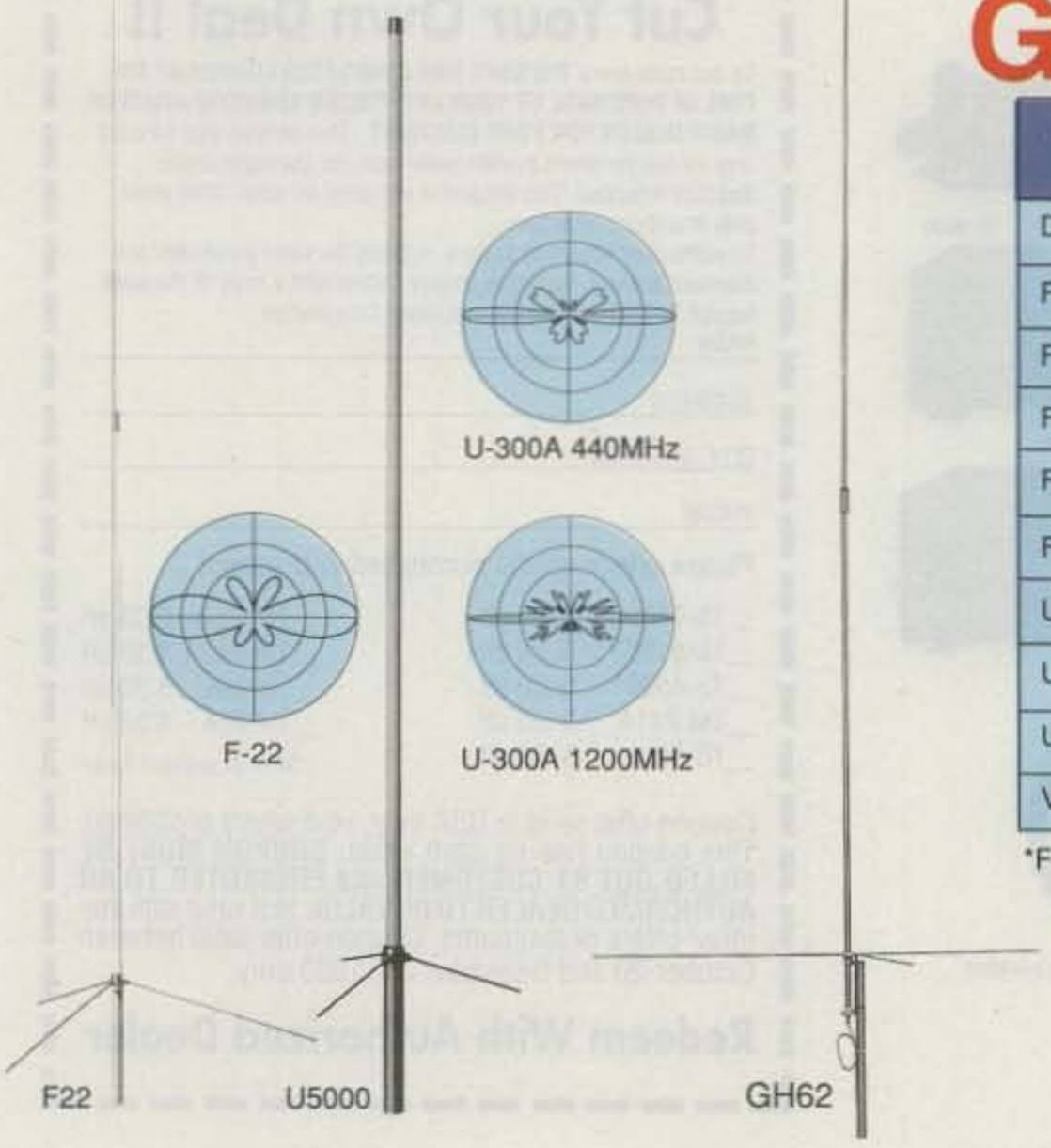
*F-718A:440 - 450MHz, F-718J:430 - 440MHz, F-718L:420 - 430MHz

U-300A 440MHz

F-22



U-300A 1200MHz



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The Radio Amateur's Journal

CQ

ON THE COVER: In Grand Prairie, Texas, Kent Britain, WA5VJB, can be found plying the VHF bands from this well-equipped shack. Somehow the modern VHF shack has a slightly different look about it than those in the "old days" back in the 1950's and 1960's. Where's the BC-459 converted to a six and two-meter VFO? (Photo by Larry Mulvehill, WB2ZPI)

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ZERO BIAS

EDITORIAL

The first half of the CQ WW DX Contest is history now and the CW portion is coming up. With any luck, that little light bulb above your head shone brightly and pointed the way toward ultimately doing better in the next one.

Somehow at this time of year our brains begin to focus on the one or two things we absolutely, positively must have to increase our score, standing, or peace of mind. To some this might be misconstrued as greed and avarice, or simply momentary confusion between need and want. However, this feeling intensifies as Thanksgiving approaches and we typically start the holiday season. I know that some stores and catalog houses push that date earlier and earlier each year, but the true holiday conservatives among us use Thanksgiving as the starting point.

By now most of us have a clear-cut vision of just what it would take to make our station better, more effective, certainly more efficient, and without a doubt, far more enjoyable. It's also fun to create an imaginary "wish list" that takes us out of the ordinary or mundane aspects of amateur radio and lets us envision the "what ifs" and super stations of our minds. To me amateur radio has always been a great hobby, as it has always centered on potential—things that could be done, things that can be done, and things that should be done. Amateur radio, as with any other hobby, exists under the premise of more—something else that exists out there, and certainly far more than exists at the moment.

While we may have this idea of what it is we'd like to have (or need or want), reality does tend to set most of us back a peg or two. We probably will not get everything on our wish list this holiday season or even the next one, but that's okay. What is important is the dream, and the goal of what could be. We all have it to some degree or another, or we'd still be satisfied with plug-in coils and crystals. Most amateurs don't look forward to putting together an adequate station and stopping at that point. In fact, I can't remember the last time (or the first time) when I heard an amateur use the word "adequate" or express the desire to strive for adequacy. Certainly, what is prevalent is the demonstrated enthusiasm for the concept of *more*.

Most of us elected to get into amateur radio based on the potential of doing something new that looked like fun. This is the same logic that anyone uses to take up any hobby, pastime, or sport. These are ways to enjoyably use our spare time and at the same time presumably improve our quality of life. Our avocations are not necessarily chosen to solve world problems, feed the multitudes, or change social attitudes. We may bring these desires with us, but generally we take up hobbies to relax, "decompress" from the everyday stresses, and enjoy ourselves.

Granted, in amateur radio, as well as in other pastimes, there are charter members of both the clean-plate club and the hair-shirt club who believe that they and only they have the true and inspired insight as to what the pastime should be. Having a good time and enjoying yourself is definitely not high on their list. If you happen to know anyone like this, might I suggest that this year you consider as a gift for him or her a new fuse holder and perhaps an almost complete package of biodegradable cable-ties.

I, for one, regale in amateur radio for its wide-open possibilities and for the simple fact that it is so many things for so many people. It's whatever you want it to be. Think of how boring it would be if everyone went on the air at the same time with the same rig and same antenna and same everything and did and said the exact same thing. Why bother?

The wish lists, the accoutrements, and our own individuality go into making it fun, enjoyable, and exciting. My antenna wish list had been about a year in the making and was sort of side-tracked by the summer storm that I described in the September issue. I'm happy to report that the new antenna was up and running in time for the WW DX Contest, and yes, it was exciting to finally see it come together. Even the inverted-Vee is repaired and up once again. It's a lot of metal for a relatively small piece of property, but what the heck. After all, it's my wish list, not someone else's.

Is it materialistic? Yes, to some degree it is. But then again, all hobbies and pastimes are. They all require the expenditure of discretionary income. Some of us have very little in that regard and some of us have quite a bit, but that mirrors life in general. While we all know where the rich folks live in town and where the poor folks reside, our spectrum space is relatively neutral with regard to finance. Where we choose to be on that spectrum is really up to our license class and not our checkbook, although sometimes I suspect that a few of us take the opportunity during a contact to play one-upmanship when describing "The rig here is." Of course you can always go back and describe "your" stacked monobanders and top-of-the-line rig. Since neither one of you can see each other, you might want to push it a bit and have the other operator stand by for an A/B comparison with "your" back-up station. I can practically guarantee that "your" primary rig will not only sound better, but will also be an S-unit or two stronger.

Still, there are things I'd like to add to my station this year, probably for no other reason than because I want to. I could rationalize a need or two, but it's strictly want. These are things that I anticipate enjoying using or simply having. It's part of my total amateur radio satisfaction package. I've always believed that a substantial part of our hobby and just about every other pastime I can think of is a healthy dose of wishful thinking.

So if you're like me, about this time of year you'll be paying extra attention to our ads and be digging up those spec-sheets that you diligently brought home from various hamfests, contemplating just what it is that you absolutely must have for whatever reason you can think of. Some of our authors have even prepared special columns describing all sorts of new and interesting stuff to tantalize us (see the December issue). About the only thing we as amateurs don't seem to have is readily identifiable clothes. After all, you can't play golf or tennis without the proper outfit. These days there seem to be specially designed sneakers and boots for just about any activity imaginable, except for amateur radio. Why not have one of those companies come up with a DXpedition series of footwear and perhaps a special model of sneaker for "Contest Comfort"? Yes, we do have caps, T-shirts (even *CQ* T-shirts), belt-buckles, and badges, but why not a safari-type outfit (camo is optional) for DXpeditioners? There could be different looks for various amateur activities, and who knows? We might catch on as a new trend.

It all comes down to having fun and enjoying ourselves with this bit of time we set aside. Sure we do good works and socially positive deeds, but that doesn't mean we don't get a sense of satisfaction from that purely fun portion of what we do. Some of us need a reminder from time to time to lighten up. What better time than the holiday season. Our holiday season celebrates various traditions of good feeling towards others. Don't leave yourself out. Enjoy it, too.

73, Alan, K2EEK

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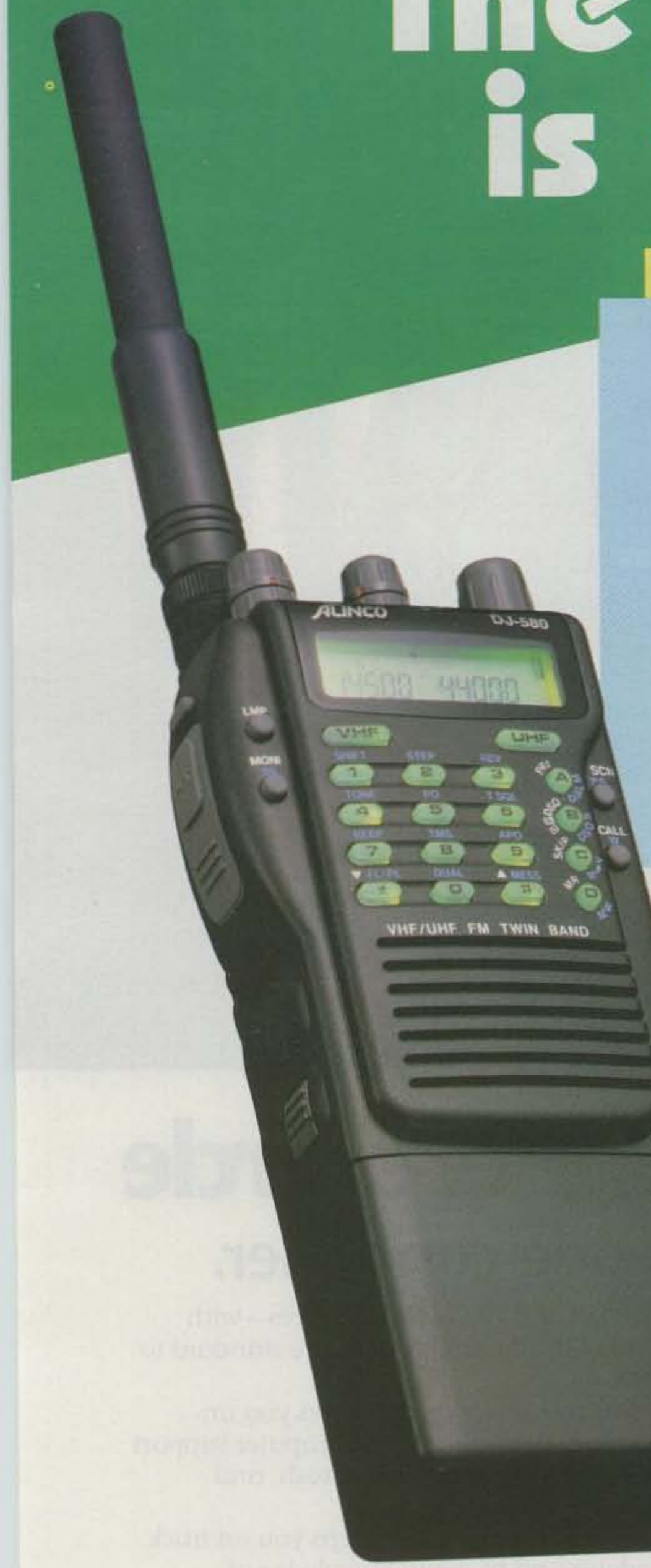

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DJ-180T

Clearly Superior

Ergonomic, rugged design, combined with excellent sensitivity and great sound make this the radio of choice for demanding operators.

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ANNOUNCEMENTS

•1993 ARNS Publication Contest – The Amateur Radio News Service will again conduct a publications contest recognizing superior performance in amateur radio journalism and evaluating club newsletters with suggestions for improvement. The contest is open to all amateur radio organizations (membership in ARNS is not required), but general circulation magazines and professional journals are not eligible. To enter submit one issue of any newsletter dated July 1992 through December 1993. Applications may be requested from Lee Knirko, W9MOL, President ARNS, 11 S. La Sale St., Suite 2100, Chicago, IL 60603. Deadline for entries is December 31, 1993.

•AACS Straight Key Day – To observe the 55th anniversary of the Army Airways Communications System a QSO Party will be held on Monday, Nov. 15 from 1700–2200Z 61 kHz from low end of each band ±5 kHz. It will be CW *for straight keys only*. Answer or call CQ AACS then ragchew. Send comments to W5LK for the AACS Alumni Newsletter.

•Northeast Repeater Net – The 8575 Group invites hams to check in to this net Tuesday evenings at 8 PM. Call net control KB2IPL, Joe, on WB2BQW–145.25 Harriman, NY, and N2HDW– 443.600 Park Ridge, NJ. Net features Newsline©, hamfest calendar, and repeater tech forum.

• The following Special Events will take place during November:

W1BD, from the Bolton Valley Resort, Bolton, Vermont; Central Vermont ARC; 1700Z Nov. 6 to 0200Z Nov. 7; 14.233 MHz, 7.233 MHz, 3.865 MHz. For QSL card, send QSL and SASE to SVARC/VGSC Special Event, P.O. Box 674, Montpelier, VT 05602-0674.

W1GB, from commemoration of the operation of the first telephone switchboard in the United States; New Haven, Connecticut; South Central Connecticut ARA; 1400Z to 2300Z Nov. 6–7; General 40 and 20 meter subbands. For certificate, send QSL and 9 × 12 SASE to Bruce Torello, AA1BX, 494 Dogwood Road, Orange, CT 06477.

W3DQI, from College Park Airport, the oldest continuously operated airport in the United States; College Park, Maryland; Laurel, MD ARC; 1700Z Nov. 13 to 2100Z Nov. 14; lower portions of the General bands, near 28.5 in Novice subband, and 147.54 FM. For certificate send QSL, 9 × 12 SASE, and your QSO nr to LARC, P.O. Box 3039, Laurel, MD 20709-0039.

W4BFB, from the second anniversary of the amateur radio education center at Discovery Place, the hands-on science museum, Charlotte, North Carolina; Mecklenburg ARC; 1400Z–2400Z Nov. 13 and 1800Z–2400Z Nov. 14; lower 25 kHz of General 80, 40, and 20 meter phone subbands, Novice 10 meter phone subband. For certificate, send 9 × 12 SASE to Mecklenburg ARC, 2425 Park Road, Room 023, Charlotte, NC 28203-5974.

K4OAR, from Sampson County Expo, Clinton, North Carolina; Sampson County ARS; 1700–2400Z Nov. 4; lower portion General bands. For certificate send QSL and SASE to SCARS, P.O. Box 64, Clinton, NC 28328.

KN4RY, from 7th anniversary of UDT-SEAL museum, Fort Pierce, Florida; Fort Pierce ARC; 1400–2100Z Nov. 13; General 40, 20, 15 meter bands, Novice 10 meters. For certificate send QSL and SASE to Fort Pierce ARC, P.O.B. 0004, Fort Pierce, FL 34954.

4-land, from Tennessee Technological University 48th Homecoming celebration; Cookeville, Tennessee; Amateur Radio Society of Tennessee Technological University; 8am–8pm CST October 30–31; General 80, 40, 20, 15, 10 meters and Novice 10 meters. For certificate, send QSL and 9 x 12 SASE to TTARS, Tennessee Technological University, Box 5262, Cookeville, TN 38505.

WB5MII, from Veterans Administration Medical Center; Albuquerque, New Mexico; Albuquerque ARC; 1700Z Nov. 11 to 1700Z Nov. 12 *(no frequencies given)*. For certificate, send QSL and 9 × 12 SASE to AARC, P.O. Box 11853, Albuquerque, NM 87192.

7-land, from the Quartermaster Depot for the Golden Anniversary of US Army Yuma Proving Ground, Yuma, Arizona; Yuma ARC; 1600Z–2400Z, Nov. 6 & 7; General SSB 15 through 40 meters and Novice SSB 10 meters. For certificate, send QSL and 9 x 12 SASE (52 cents postage) to YARC, P.O. Box 7077, Yuma, AZ 85366.

W9DUA, from Veteran's Day celebration, Springfield, Illinois; Sangamon Valley, RC; 1400–2200Z Nov. 11; General portions of 160–15 meters, Novice 10 meters. For QSL send business-size SASE to W9DUA SPL EV Station, SVRC, Red Cross Building, 1025 S. Sixth St., Springfield, IL 62703.

TM50DAY, from remembrance of landing of the allies in Normandy 50 years ago; amateurs from the VRZA, Kagerland Div. PI4KGL, and Dordse Electronic Club PI4DEC; 2201Z June 6, 1994 to 2159Z June 8, 1994 *(no frequencies given)*. For more information or to participate as a guest operator, contact TM50DAY Group, The D-Day Memorial AR Group, P.O. Box 1126, 2340 BC Oegstgeest, The Netherlands (phone +(31)1711-12462; FAX +(31)1711-10116).

VP2M, from opening of new clubhouse, 15th anniversary of the society, and 500th anniversary of Montserrat naming; Montserrat ARS; Nov. 14 *(no times given)*; 80, 40, 20, 15, 10 meters. For QSL send SAE and 1 IRC to VP2M, P.O. Box 448, Plymouth, Montserrat, West Indies.

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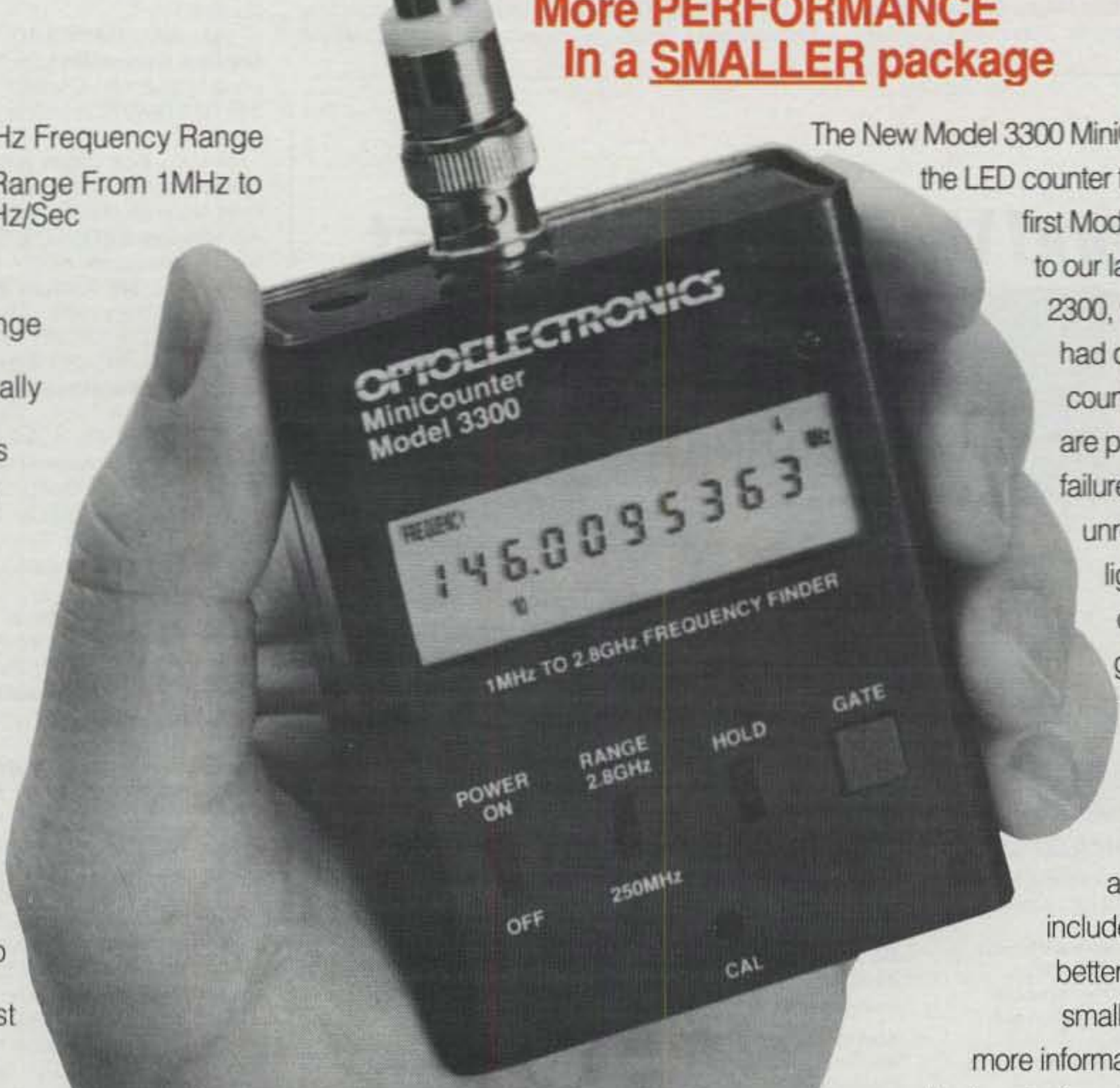

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VG3W, from McCrae House Museum, birthplace of Colonel John McCrae, Guelph, Ontario, Canada; Guelph ARC; 10am–5pm EST Nov. 6–11; 10, 15, 20, 40, and 80 meters. For QSL, send one IRC or Canadian postage on SASE to VG3W c/o VE3ZM, P.O. Box 1305, Guelph, Ontario, Canada N1H 6N9.

VF7L, from 135th anniversary of proclamation creating colony of British Columbia, Fort Langley, BC Canada; Fraser Valley ARA; 1700–2300Z over the three days Nov. 19–21; General portions 20, 15, 10 meters. For certificate send 9 × 12 SASE or $1.00 to Fraser Valley ARA, Box 50, Fort Langley, BC, V0X 1J0 Canada.

• The following hamfests, etc., are slated for November:

Oct. 30, **Gateway To Ham Radio Club Hamfest,** West County Tech. School, St. Louis, MO. Contact Dave Novak, NØDN, 10 Ann Ave., Valley Park, MO 63088 (314-225-1952).

Nov. 6, **Lake ARA Annual Hamfest and Electronics Expo**, Lake County Fairgrounds, Eustis, FL. Contact Cole A. Ruck, KC4UIG, at 407-273-1624 (evenings) or Pat Paris, WD4LXN, at 904-669-7279 (evenings). (W5YI testing, all classes.)

Nov. 6, **9th Annual "6.91 Friendly Fest,"** St. John the Evangelist Congregation, 8500 W. Cold Spring Road, Milwaukee, WI. Contact Milwaukee Repeater Club, P.O. Box 2123, Milwaukee, WI 53201. (Exams.)

Nov. 6, **Carthage Amateur Radio Society Hamfest,** Carthage Memorial Hall, Carthage, MO. Contact Jim Dixon, WXØJ, P.O. Box 783, Carthage, MO 64836 (417-358-4126).

Nov. 6, **Enid, Oklahoma Hamfest,** sponsored by Enid Amateur Radio Club, Hoover Building, Garfield County Fairgrounds. Contact Fred, N5QJX, 405-242-3551 or Tom, N5LWT, 405-233-8473. (VE exams, walk-ins welcome.)

Nov. 6, **1993 Cookeville Hamfest,** Hooper Eblen Center, on TTU campus, Cookeville, TN. Contact Rich, KD4ABC, 615-528-7171. (Exams.)

Nov. 6, **Washington Mt. Baker ARC Flea Market,** Ferndale Band Boosters Bingo Hall, Ferndale, WA. Contact Terry Andrew, VE7BUS/W7, 1009 Glenning St., Lynden, WA 98264 (206-354-5868). (VE exams.)

Nov. 6–7, **Alford Memorial Radio Club 1993 Hamvention & Computer Expo**, Gwinnett County Fairgrounds, Lawrenceville, GA. Contact Alford Memorial Radio Hamfest, P.O. Box 3100, Lithonia, GA 30058, or call 404-985-8750, FAX 404-985-5725. (Exams.)

Nov. 6–7, **HAMEXPO '93 WEEKEND & ARRL Section Convention**, Suffolk Community College, Long Island, NY. Contact Valerie DeRicco, N2NYB, 516-874-3669 or John Mark, KB2QQ, 516-689-6343. (Exams.)

Nov. 7, **Fox Cities ARC, Wisconsin, Ham and Computer Fest,** Starlite Club, Kaukauna, WI. Contact Dan Vanevenhoven, N9LVS, 2410 E. Newberry, Appleton, WI 54915 (414-739-5101). (Exam info contact Larry Siebers, KD9IA, 414-788-3823.)

Nov. 13, **NE Kansas ARC Hamfest**, Knights of Columbus Grand Hall, Topeka, Kansas. Contact Rob Nall, WVØS, 5707 SW 28th Terrace, Topeka, KS 66614-2420 (913-271-8899, 24 hours).

Nov. 13, **Mayflower ARC Fleamarket**, Plymouth Memorial Hall Bldg., Plymouth, Massachusetts. Contact Jon, WS1K, 508-746-0162. (Exams, walk-in.)

Nov. 13, **16th Annual Montgomery Hamfest and Computer Show**, Garrett Coliseum at the South Alabama State Fairgrounds. Contact Hamfest Committee, c/o 111 Diane Drive, Prattville, AL 36066, or phone Jiggs at 205-365-0380; FAX 205-264-1150. (Exams.)

Nov. 13, **First Annual Myrtle Beach Hamfest,** Myrtle Beach High School, Myrtle Beach, SC. Contact Mrs. Wood, 803-293-7888.

Nov. 13, **Central Pennsylvania Repeater Assn. HERSHEY HAMFEST,** Hershey Armory. Contact Harold Bear, N3LZH, at 717-566-8895. (Exams.)

Nov. 13–14, **Fort Wayne Hamfest & Computer Expo and 1993 Indiana ARRL State Convention,** Allen County Memorial Coliseum Expo. Contact Fort Wayne Hamfest & Computer Expo, P.O. Box 10342, Ft. Wayne, IN 46851 (219-484-3317). (Exams.)

Nov. 14, **Southcentral Connecticut ARA 14th Annual Fleamarket,** Branford Intermediate School, Branford, CT. Contact SCARA, P.O. Box 705, Branford, CT 06405-0705, or call Brad at 203-265-9983. (Handicapped accessible; exams.)

Nov. 14, **Chicago ARC Ham Auction,** DeVry Institute of Technology, 3300 N. Campbell, Chicago, IL. Contact Chicago ARC, 5631 W. Irving Park Road, Chicago, IL 60634 (545-3622).

Nov. 20, **Third Annual Westshore Hamfest,** Holland Christian High School, 956 Ottawa Avenue, Holland, MI. Contact Westshore Hamfest, c/o Joe Campbell, 10413 Northfield Drive, Holland, MI 49424 (616-772-4928). (Exams.)

Nov. 21, **W.A.COM Tri-State Hamfest & Computer Fair**, Chartiers-Houston High School, Washington, Pennsylvania. Contact Ted Lockman, WB3BZK, 412-222-6473. (Exams.)

Nov. 21, **Electronic Flea Market,** Knights of Columbus Hall, Rt. 6, Mattapoisett, MA. For more information call 508-993-3993.

Nov. 21, **JARSFEST93**, Benson, NC, sponsored by Johnston ARS. Contact Bill Lambert, AK4H, 8917 NC 50 N., Benson, NC 27504.

Nov. 27, **Central Illinois/St. Louis Area ATV Banquet**, Ariston Restaurant, Litchfield, Illinois. Contact Central Illinois/St. Louis Area ATV Club, 907 Big Four Ave., Hillsboro, IL 62049-1009.

Nov. 27, **Greater New Orleans Hamfest**, St. Bernard Cultural Center, New Orleans, Louisiana. Contact Greater New Orleans Hamfest, P.O. Box 51822, New Orleans, LA 70152-1822.

Nov. 27, **Evansville Winter Hamfest,** sponsored by EARS, Vanderburgh County 4-H Center on Hwy. 41 just north of Evansville, IN. Contact EARS, 1506 S. Parker Dr., Evansville, IN 47714 or call Beverly Hensley, KA9PDG, at 812-479-5741. (Handicapped accessible.)

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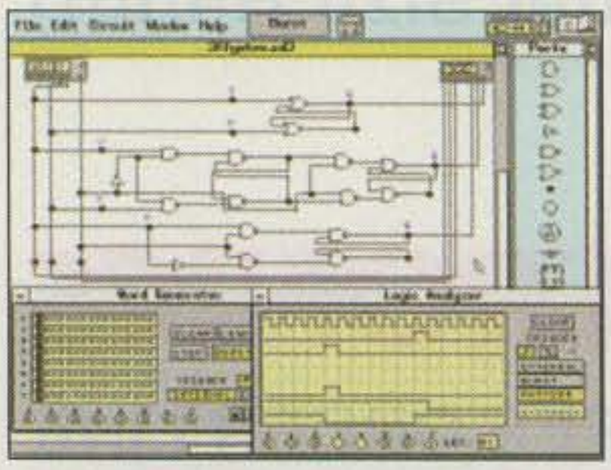

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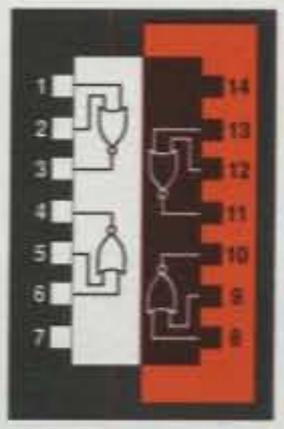

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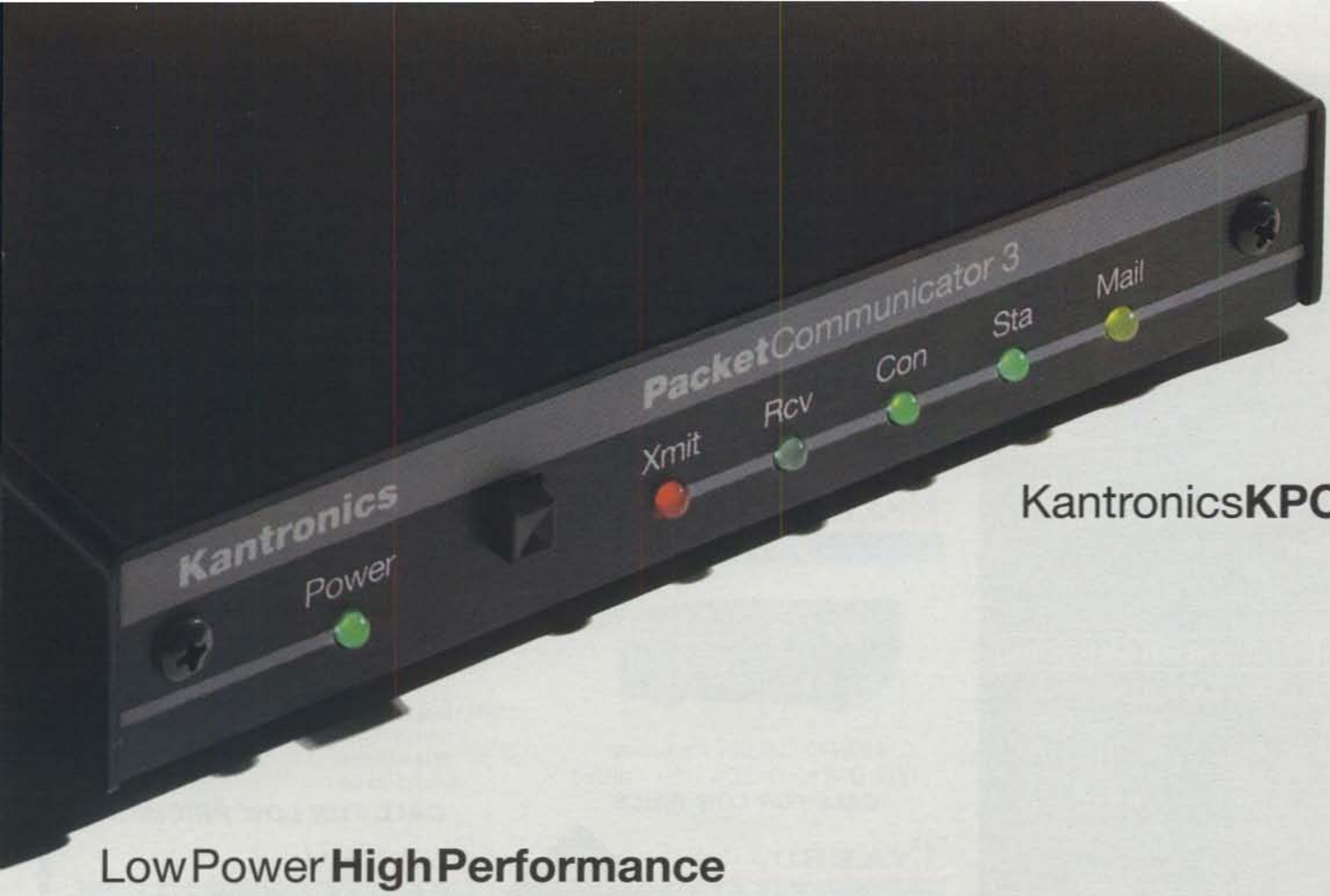

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The AH1A Saga
A DXpedition To Howland Island
Part II—Getting Home Is Even Harder

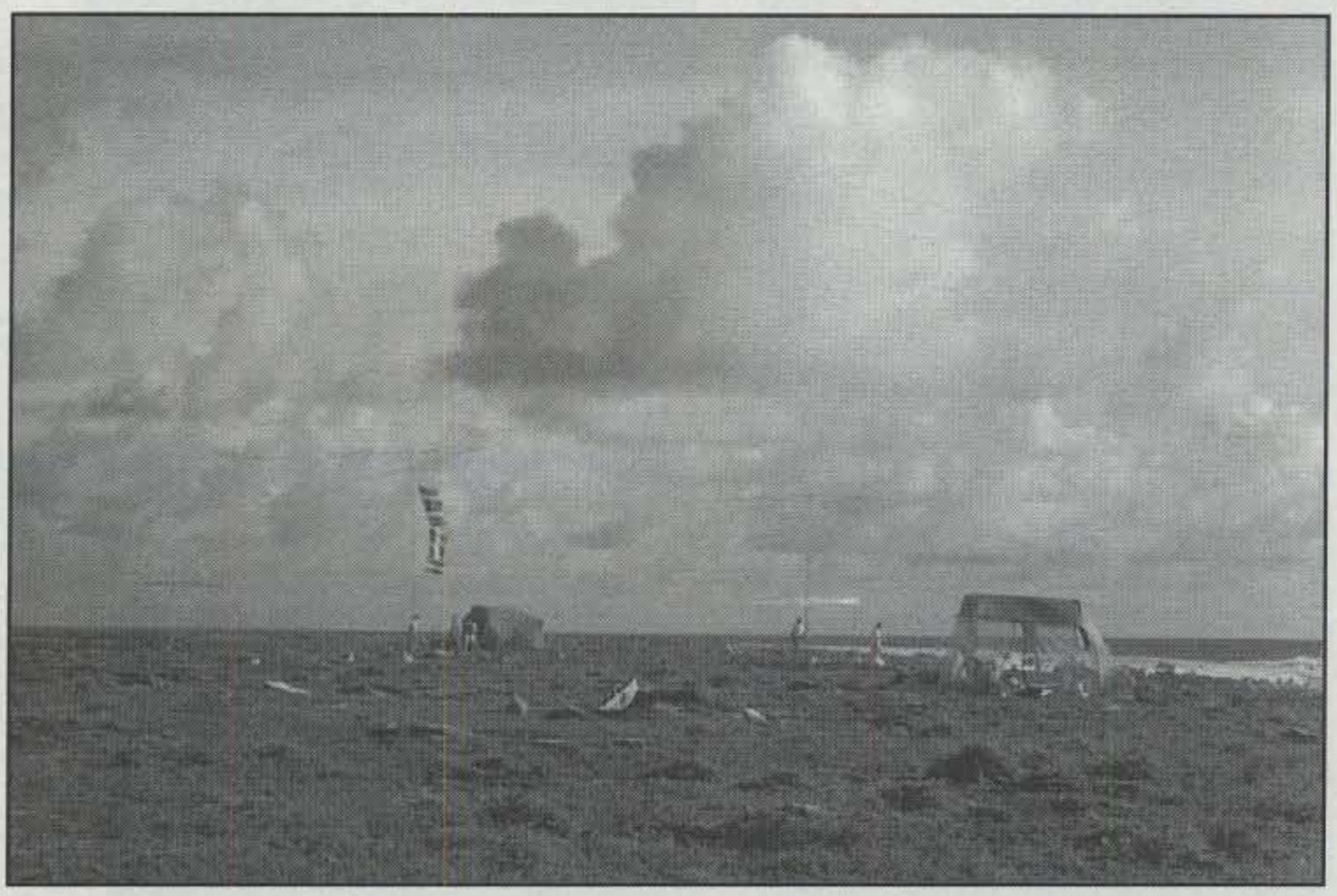
BY WALT STINSON*, WØCP

By Wednesday, January 27 we were up on every band except 30 meters, which went up Thursday. There were many highlights, including the brief opening on 6 meters to Japan; excellent late-night runs to the USA on 80 meters; and very good rates on 160 meters with stronger than expected signals. The equipment was working superbly, and the signal reports were outstanding to most areas of the world. Unfortunately, the flux had dropped to its lowest level in years, and propagation on 10 meters was almost nil.

Conditions to Europe were also poor. This concerned us, as working Europe was our primary goal. We redoubled our efforts on the lower bands—80, 40, 30, and 20—and it really paid off. While signals were never strong, about 25% of the callsigns in the log are Europeans.

Working Europe from Howland was extremely challenging. We struggled each morning to put a few more Europeans in our 80 meter log. At dusk we concentrated on the 40 meter CW openings and were rewarded with many extraordinary QSOs under the most difficult circumstances imaginable—big pile-ups of exeedingly weak signals. We were impressed with the patience and skill of the European operators who made it into the log—a truly outstanding group. They got through despite the poor conditions. Because the openings were brief, the timing was especially critical.

We had been warned to expect unruly European pileups, but for the most part all stations, including Europeans, were very professional in their operating, and our rates reflected this. Even the Italians, who had a big propagation advantage due to their southerly latitude, stood by when requested and allowed hundreds of northern European stations into the log.



The AH1A camp. Obviously, the highest terrain around and with no neighbors in sight, the SSB tent is positioned near the flags and the screened tent to the right.

The use of "pilot stations," headed by WYØJ and K1ER/Ø in the US and ON4WW in Europe, ensured daily feedback on any concerns about our operating procedures. We made quick adjustments accordingly. For example, we were told that 30 meters was providing the best signals to Europe, so we began emphasizing that band, with excellent results. We also made several hundred 20 meter RTTY QSOs because of the recommendations from our pilots.

Getting feedback from halfway around the world kept us focused on the European propagation. It would have been easy to work just west coast Americans and Japanese, who were always loud, and overlook the weaker Europeans and the east coast Americans. Instead, our team worked the difficult paths whenever they were open, and the rest of the world cooperated marvelously.

With eight HF operators and four HF stations, each operator averaged 12 hours of operating per day. Working on antennas and keeping the camps maintained consumed more hours. Very little time was left for sleep. The bugs, crabs, and rain conspired to rob us of sleep, when we found time for it. We became a bunch of walking zombies trying to keep all the rigs on the air 24 hours a day. We were, however, making over 7000 QSOs

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Here's the author, WØCP, exhibiting what used to be called "the 1000 yard stare," but what probably is the result of DX pileupitis.

Here's Mike McGirr, K9AJ, assembling the Cushcraft A3WS WARC band Yagi.

per day, and that kept enough adrenalin flowing to keep us awake when in front of a radio—most of the time.

Up to a year had gone by on Howland without any recorded rainfall, so we were unprepared for the torrential downpours that followed. It rained for several days straight, at a peak rate of one inch per hour. Everything, except our precious operating equipment, got soaked. Even the high-quality tents began to leak, and at times there was two inches of water on the floor. As the rain soaked into the thirsty soil, the smell of guano permeated the air. The conditions were akin to living on the floor of a giant bird cage.

We normally bathed in the ocean. We used Joy, which lathers well in salt water, but we never felt completely clean due to the salt residue that remained after the water evaporated. On several afternoons the rain came down so hard we showered in it. It felt good to rinse off the salt residue. Along with the rains came very high winds, which threatened to damage the tents and antennas. Incredibly, they held up, but the metal eyelets were ripped from our tarps.

Each day we worked a bit more to improve the antennas. While heat and exhaustion prevented us from phasing the Butternuts, we did get three of them up, plus the Battlecreek. This gave us the flexibility to work 160, 80, 40, and 30 meters simultaneously. We also laid down elaborate radial systems. They were constructed from four 150 foot rolls of 4 foot wide galvanized chicken wire and several thousand feet of 24-gauge magnet wire. Conditions were terrible to Europe on 10, 12, and 15 meters, but the excellent low-band antennas helped make up for it.

Friday night we operated just about all night in the CQ WW CW 160 Meter Contest. We debated doing this, because a contest can detract from the success of a DXpedition. However, we felt that the 160 contest would allow us to maximize our QSOs on that band. Besides, K4UEE, a member of SEDXA, wanted to help his club beat the Frankford group this year by contributing a strong entry. We ended up with well over a thousand QSOs on 160. To my ear, Bob has the sweetest sounding fist east of the Mississippi. I imagine it sounded very sweet to the deserving who got through on 160, too.

By the time Saturday rolled around we were ready for the weekend crowds. Working the huge pileups was an incredible thrill for everyone. It was the culmination of years of DXing and contesting experience. Peak CW rates approached 250 per hour, and the phone rates, 400 per hour. With the help of the WF1B software, even the RTTY rates were high. It was fun!

To maximize the total rate, we decided to have five HF stations going simultaneously during the weekend. The ICE bandpass filters worked great, and we had minimal inter-station interference. We enlisted the help of PA3DUU and W9IXX, who until this time had been spending all their time in the VHF tent, and the combined rate zoomed. With so many stations on the air, we were able to attend to another of our goals—working a few Novices on CW. We went down to 15 meters, cranked back the speed on the keyer, and made CW contacts with the following lucky Novices and Techs: KD6FWY, KC6FWH, KA9TTB, and KB6LEV. We were also able to pay more attention to the WARC bands.

The performance of the stations was outstanding. The computers worked flawlessly, despite the searing heat, as did the Alpha 89's and the Kenwood 450's and 850's. The prototype Heil headsets covered our ears and kept out the generator noise, and they provided great audio on both transmit and receive. The Cushcraft monoband Yagis were superb performers and gave us wonderful flexibility and light weight. The Butternut HF2V verticals did a fine job for us on 30, 40, and 80, and the Battlecreek special got us into a lot of logs on 160. It is a testament to the quality of these products that they performed so well and so reliably in this salty, hot environment.

On Sunday evening, with the weekend over and pilups subsiding, we turned our attention to planning for the departure. We decided to take down the VHF station Monday afternoon, the CW stations and one of the SSB stations Tuesday afternoon, and then, Wednesday morning, the final SSB station. We had to be completely off the island by noon Wednesday, February 3, to reach Tarawa, Kiribati in time to catch the weekly Air Nauru flight back to Honolulu.

Monday afternoon, February 1, the *Machias* sailed back from Baker and anchored several hundred yards off the reef. She kept her engine idling to keep her away from the reef and to keep the line taut. That night the engine quit and the boat began drifting toward the reef. Attempts to restart the engine were unsuccessful. Captain Bill ordered the Zodiacs into the water to attempt to pull the 100 ton *Machias* away from the reef. We watched with concern as the vessel came within 30 feet of running aground on the reef. Finally the Zodiacs succeeded in reversing the ship's course.

Tuesday morning, February 2, the *Machias* was nowhere in sight when we awoke. She had safely spent the rest of the night several miles out to sea, where the captain had managed to get the engine started again. Later that day we got one load out to the boat, as we began the work of winding down our operation. We had met our goal of one solid week of operating, and now it was time to go home. Our focus turned to dismantling and packing the stations.

The surf had picked up a bit, so the captain himself was piloting the Zodiac as it

Say You Saw It In CQ

came in for a second load. As the Zodiac attempted to clear the reef, a huge breaker washed over it, threw it straight up in the air, and flipped it over, spilling the entire load. For several tense minutes the captain struggled for his life against the powerful current, until he was finally able to reach the surface and swim to shore. He had several abrasions and water in his lungs, but he was okay.

After resting, the captain decided to try to return to the ship before nightfall. Although the Zodiac was undamaged, the high surf continued, and further attempts to clear the reef were impossible.

The captain came up with another plan. He called the *Machias* and asked the crew to tie a line to the Zodiac and throw the line into the surf, to be washed ashore. The crew tied a big plastic bucket to the line to catch the surf. The waves were cresting just outside the reef. The crew rode the Zodiac along the edge of a wave and threw the bucket over the wave and into the surf. Then they sped away before the wave could catch them and wash them ashore.

Once the bucket and line were ashore, the captain attached his surfboard and had the Zodiac tow him out. The first couple of attempts were unsuccessful. The surfboard got caught in the waves and flipped, in much the same way the Zodiac had earlier. Finally, a lull allowed him to make it through, and he made it safely to the ship.

Our captain was low key about these problems. We suspected, just by the look of the sea, that we might be stuck on Howland for days. He was calm and confident, however. He suggested that we start collecting rain water. That night we arranged a tarp over a depression to collect some water. W9IXX and PA3DUU rigged up their tent to collect run-off. During the night we collected several gallons of water. We could have collected much more, had we taken the situation more seriously. It's hard to get serious about water conservation when you are in torrential rains.

The next day, Wednesday, February 3, was the day of our scheduled departure. When we arose that morning it was obvious that we would not be leaving. A big storm had come in the night before, and the surf was pounding our landing area with 10 foot breakers. The boat had been tossed about wildly during the night. We received word on the HT that the captain had injured his wrist while on watch. He wrapped some duct tape around it and continued to work, but the crew was convinced that it was broken.

Ashore, we were down to just one station on the air, one mast with 10 and 20 meter monobanders on it, and a few gallons of fuel. We did a quick QSO count and figured we were just shy of 50,000

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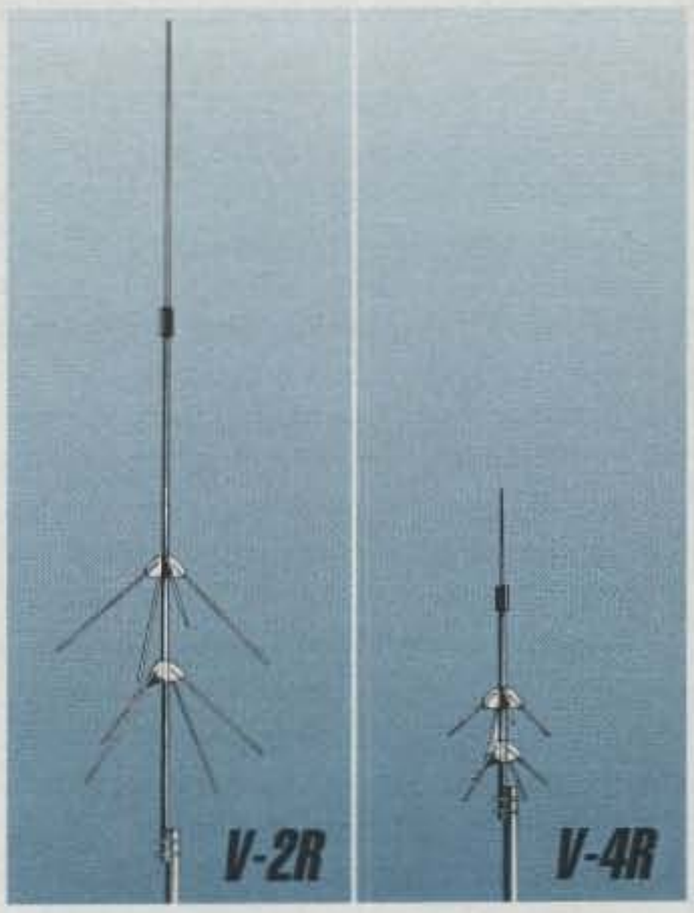

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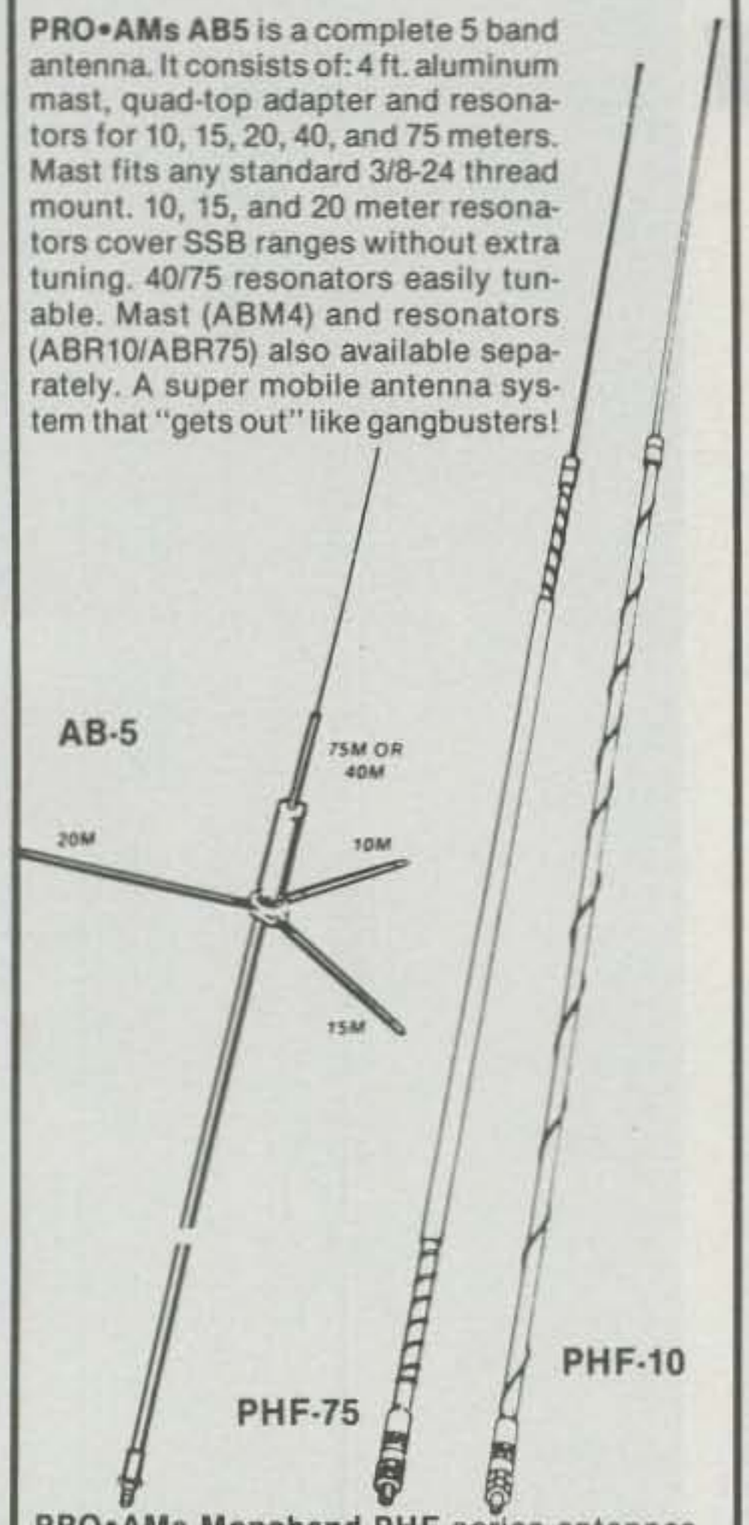

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QSOs, so we decided to keep this last station on the air. We continued to pack up the rest of the equipment and supplies and tear down antennas. We resumed our afternoon schedule with the MHDXA back in Colorado and kept in close contact with Pat, KH6DD, in Honolulu. We let them know that we had hit a snag and we were stranded.

Several thousand stations got in the log thanks to that last station remaining on the air. Ten meters finally opened up, and we worked several hundred east coast amateurs on that band. We also worked a bunch of Novices and Tech-Plus stations on 10 meter SSB. We moved our 20 meter frequency up the band to the General portion for several evenings and exposed many casual DXers to our expedition. Moreover, hundreds of amateurs with modest stations who had been trying unsuccessfully every day to get through finally made it, and our QSO total reached 52,000. It was a good way to end the operation.

There was no resupply of food or water on Wednesday. On each previous day the crew had brought in our food at mealtime and set it up on a long table near the beach. However, this day the high surf kept the crew on board. Around dinnertime the storm broke, and I wandered down to the food area in search of scraps. Several team members were already down there eating dry cereal. Wheat Chex was the favorite. We noticed a jug of ketchup and created a dip for the Wheat Chex, which was especially popular with the Europeans.

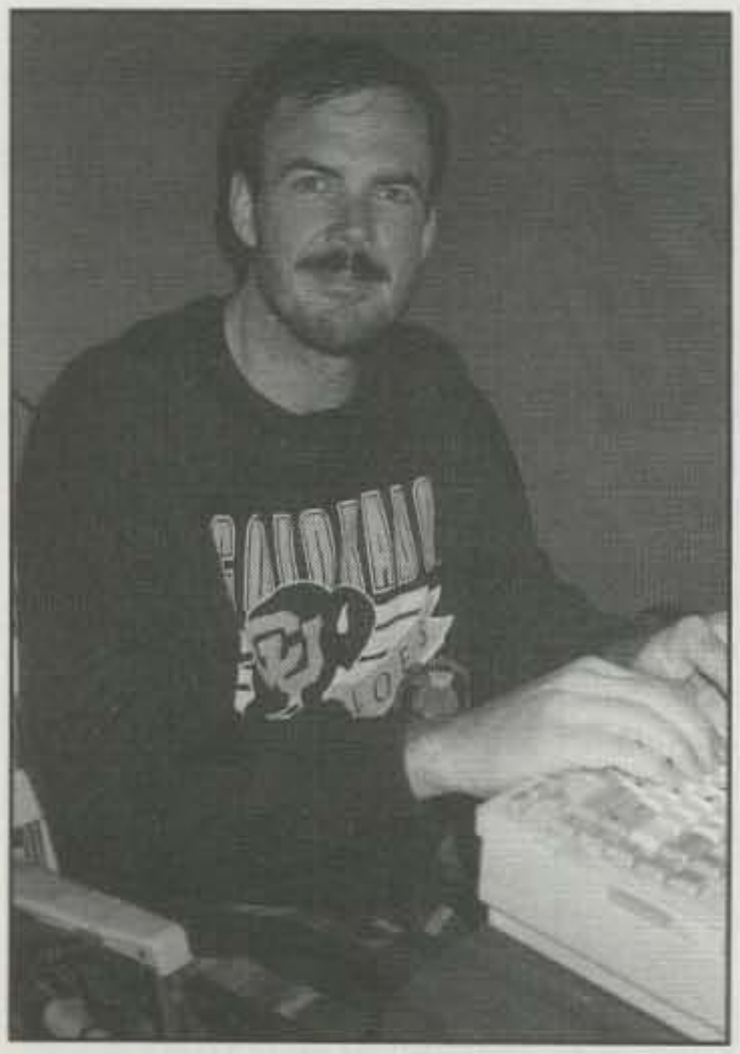
Later we discussed options with the captain and decided not to call for help, but to wait it out—not that we had any alternative. The nearest help was four days away, at least. The travel window for making our connections was now closed, and we had to make new plans. Understandably, our family and friends were beginning to worry, so we kept our transmissions upbeat and tried not to alarm anyone. We were still confident that we could solve our problems, but the tension level was rising.

Thursday, February 4, Kurt and Captain Bill were unceremoniously deposited ashore with us. They were out in a Zodiac trying to toss us some food and got on the wrong side of a big breaker. Burt, WØRLX, and Mike, K9AY, our medical doctors, were anxious to get a look at the captain, and proclaimed his wrist officially broken. They brought out some "instant cast" and had him fixed up within an hour.

We celebrated their arrival that evening with the "real" food they had been trying to throw to us. We even had pudding for desert. However, even as we were enjoying our meal, we knew that we were very low on both food and water. It was obvious that resupplying us would be both difficult and risky. We decided to turn over our remaining supplies to Kurt and begin rationing. We each received one pint of water that evening, which was to last for the next 24 hours. That night we made room for Kurt to sleep on the floor of the operating tent. The captain slept in the Zodiac.

Friday, February 5, we learned that the

Burt Myers, WØRLX, takes a turn operating in the CW tent. Burt is also shown enjoying what passes for island air-conditioning—the fan, which at those tem peratures was a necessity, not a luxury.



Randy Martin, KØEU, looks surprisingly refreshed after a cold rain shower. This new-found energy helped him operate the 15 meter RTTY position.

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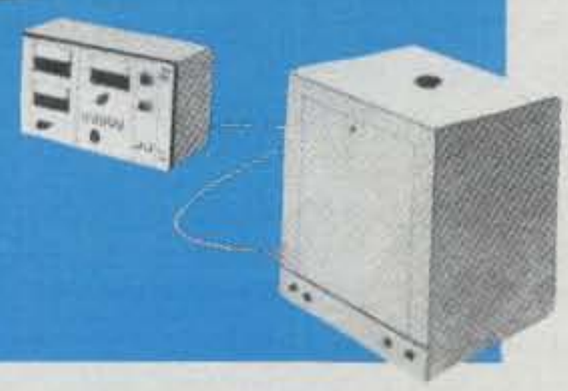

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This is Paul Granger, F6EXV, running a pileup on 15 meter SSB. Computerized logging was used and really came in handy.

AH1A Statistics

Band	Number of QSOs CW	SSB	RTTY	SAT	EME
6m	31	57	—	—	—
10m	1697	2986	—	—	—
12m	1128	1749	—	—	—
15m	4350	8964	403	—	—
17m	1195	2158	—	—	—
20m	5579	8362	295	—	—
30m	2046	0	—	—	—
40m	3910	2290	—	—	—
80m	1799	1782	—	—	—
160m	1049	0	—	—	—
Total	**22,784**	**28,348**	**698**	**546**	**1**

Grand Total: 52,377

(Notes: EME QSO was with W5UN; all 6m QSOs were with JA stations.

Table 1-Final statistics for the AH1A operation.

boat's electrical system had failed during the night. The generators had died and the batteries were too weak to start them up again. Without its electrical system, the boat was in serious trouble. The water makers and pumps would not work, nor would the radar, radio, or geopositioning equipment. Phil volunteered to go out to the boat and try to bring the system back up and Kurt agreed to take him.

By mid-morning the water rationing was beginning to affect morale. On Howland you can sweat one day's ration of water in an hour. Some team members had consumed their entire pint during the night and were getting desperate. Others were drinking it one sip at a time. But either way, the physical effects of dehydration were beginning to be felt by everyone. It was clear that we couldn't survive long without water.

At around 11 AM the captain informed us that he had discovered some rainwater captured in the clam shells on the east side of the island. He asked for a volunteer to help him collect it. Though I wasn't eager to hike a mile across the island in the midday sun, this was my chance to see the east shore and the remains of the airstrip, so I volunteered.

I noticed that the captain had discarded his cast. Apparently, he was willing to risk permanent problems with the wrist to have full use of his hands during this critical stage of our journey. As we walked across the island, I had to work hard to keep up with him, despite my daily workouts for the 90 days preceding the trip. I felt a bit more confident, knowing he was in such excellent condition, as I suspected that there would be more physical challenges ahead for both of us.

The airstrip had just about totally blended into the terrain. We could barely see the outline of the strip in the scrub bushes and grass. Closer up, however, evidence of the strip was more obvious. The strip had been constructed of crushed coral. It crunched under our feet as we walked over the spot where Amelia Earhart had intended to land more than 50 years earlier.

Deposited on the eastern shoreline are thousands of large clam shells, many as big as large serving plates. The shoreline here is steeper than the western one that we called home, and many shells are safe from saltwater contamination, except in the worst of storms. Right after the rains ended, each of these shells had contained several ounces of fresh water. Now, several days later, most of the water had evaporated. But the captain was right: every tenth shell or so still had a few precious drops, and occasionally we found a shell that was still full. We collected about four gallons of very dirty, but drinkable, water.

On the other side of the island a more dangerous struggle for survival was occurring. Peter, ON6TT, had ventured down to the shore to rinse off in the surf. Though he was careful not to get too near the reef, a large wave overcame him, pulled him under the reef, and swept him out to sea. Fortunately, Kurt saw that Peter was in trouble and swam out to him with a rope. He grabbed Peter, who was still conscious, and they were both pulled in by the shore team. Kurt was credited by several witnesses with saving Peter's life.

When we returned with the water, we found Mike, K9AJ, dressing Peter's wounds. His injuries consisted mainly of minor coral lacerations on his chest, back, and legs. Mike and Burt, WØRLX, were dabbing them with vinegar, which helps neutralize the coral toxin, and Peter was grimacing with each dab. It didn't take long, though, for Peter to regain his great sense of humor. He loved showing off his chest wounds, which scabbed into the shapes of Baker and Howland.

Once Peter's condition was stabilized, we turned our attention to treating the water we had collected. It was contaminated with lizard feces, and most of the team was very unenthusiastic about drinking it. The captain had consumed a few pints of it the previous day and was still feeling fine, so we were confident of its drinkability. We filtered it through a tee shirt to remove the larger contaminants and Burt treated it with iodine to kill off the bacteria.

Bob, Arie, and I quickly returned to the east shore and collected another four gallons. Panamax, our power conditioning sponsor, also makes Fitmax carbon-filtered water bottles. They generously sent along about 100 because "they might come in handy," and they sure did! We used these bottles to filter out the clam-shell water, and for the first time in several days we drank freely.

The entire team assembled on shore at high tide for Phil and Kurt's daring escape attempt. We held on to the Zodiac and walked it out onto the reef, trying to keep it from flipping as the surf crashed over us. The outboard motor took about 20 pulls to get started, and then we waited for just the right moment—a lull in the surf. When Kurt gave the signal, we let go and he gunned it. Just as it looked like they would make it clear, another huge breaker came rising out of the ocean. It tossed the front of the Zodiac straight up in the air. We thought they were goners, but amazingly the rubber boat came down right side up. In a few seconds they were clear of the waves and headed safely for the boat.

The next morning, Saturday, February 6, we dug a hole for the anchor. By mid-afternoon a very long tow line had successfully been attached between the anchor and the ship. With the power down, the crew needed a way to judge its position so that it didn't drift into the reef. We set up a makeshift beacon system con-

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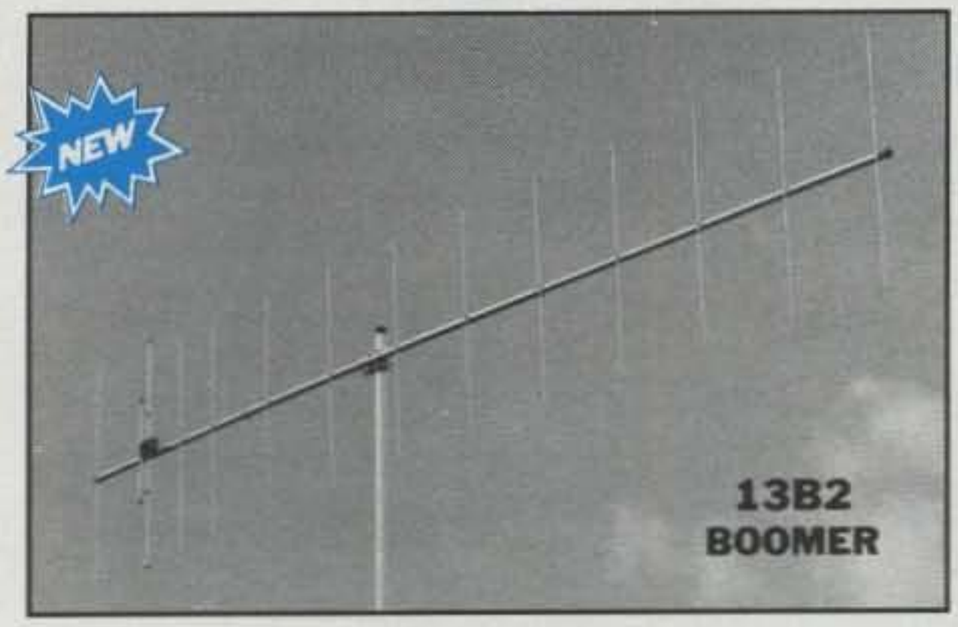

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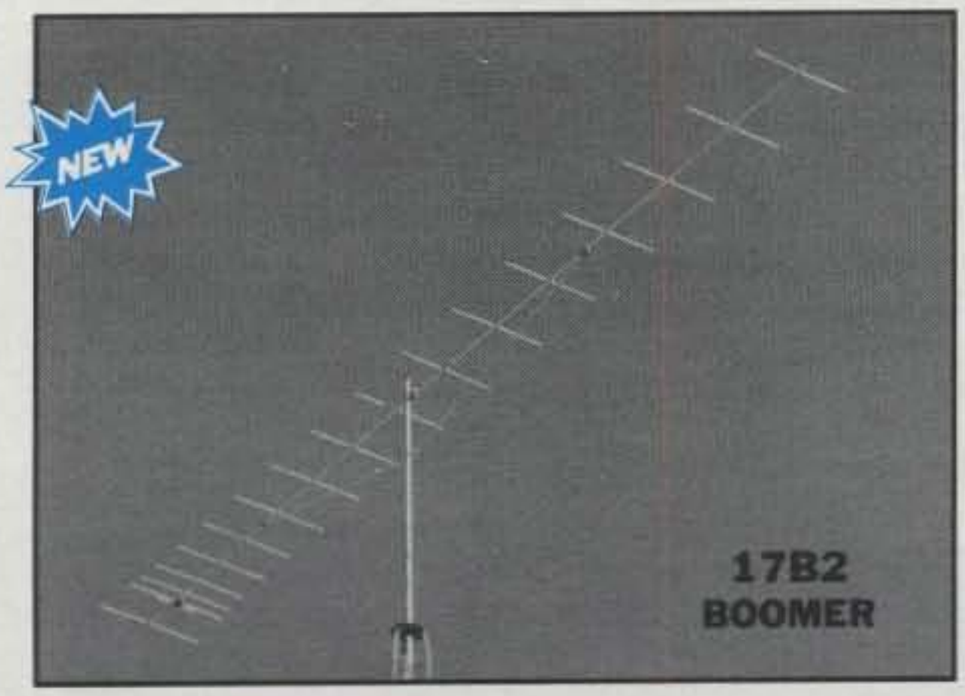

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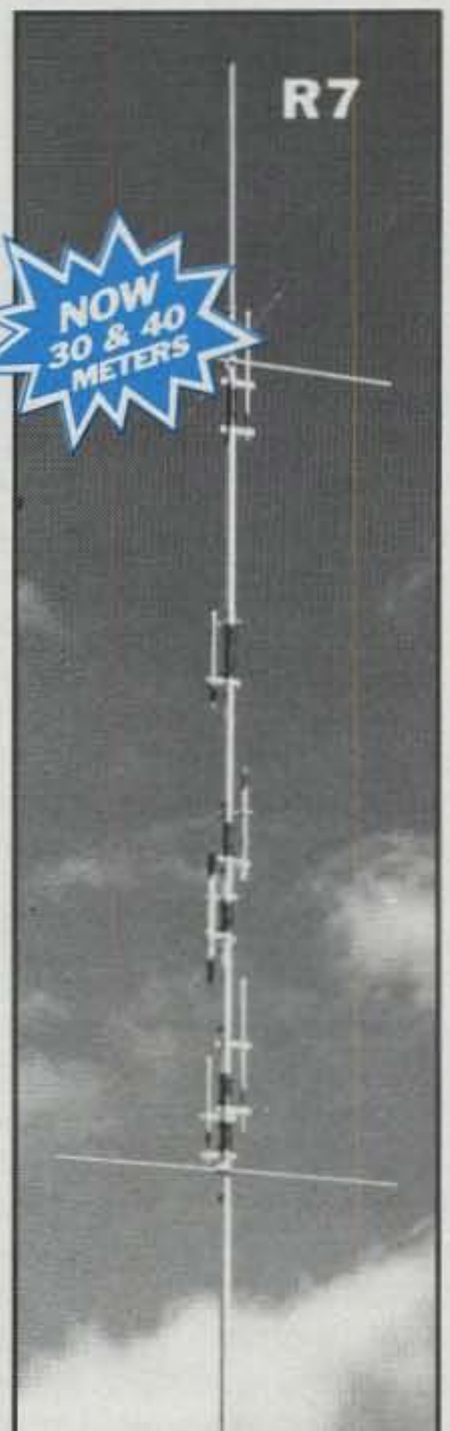

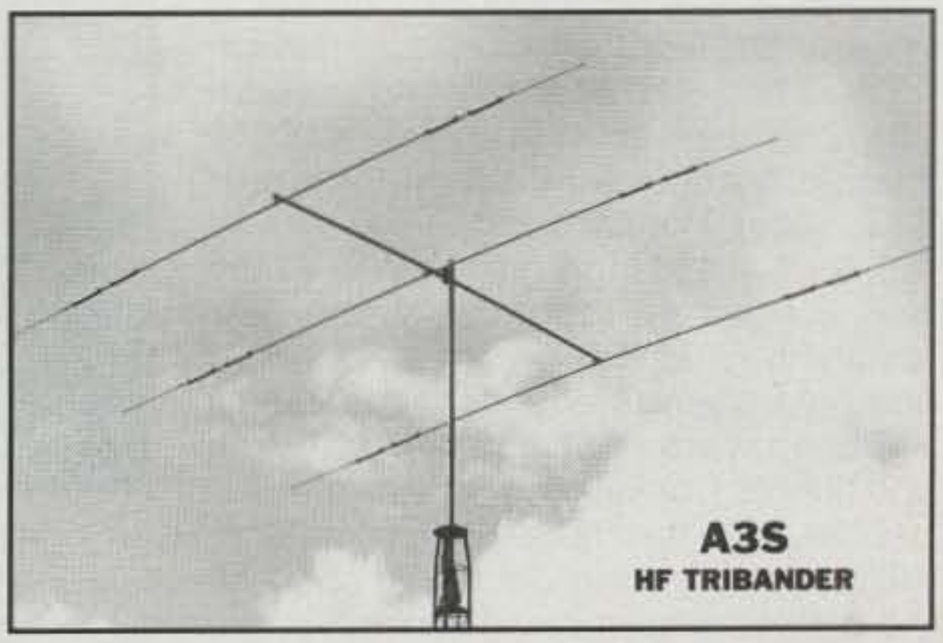

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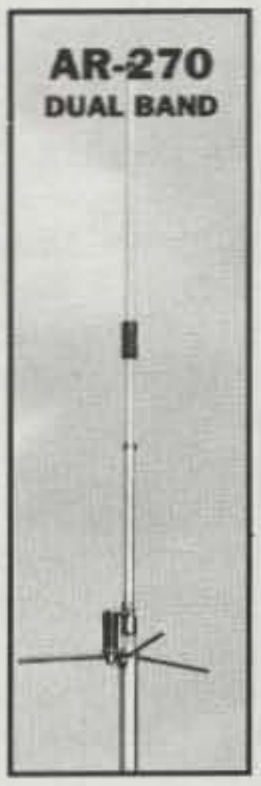

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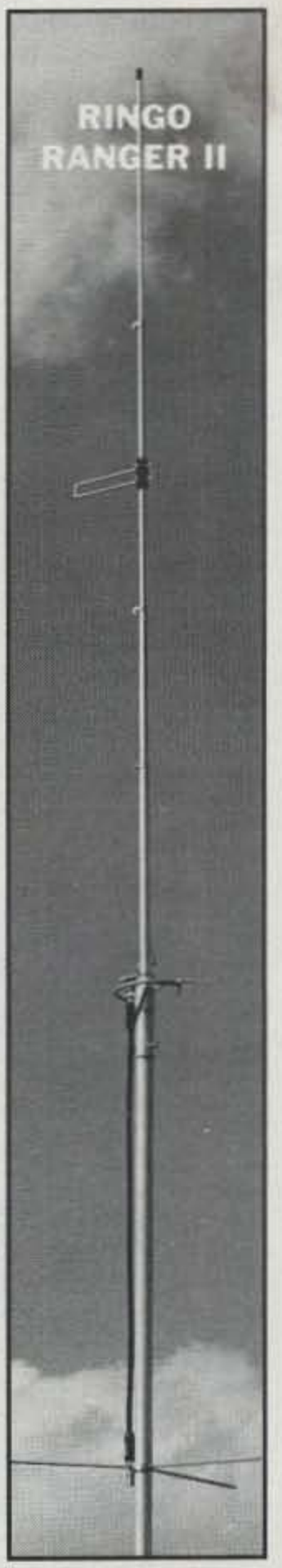

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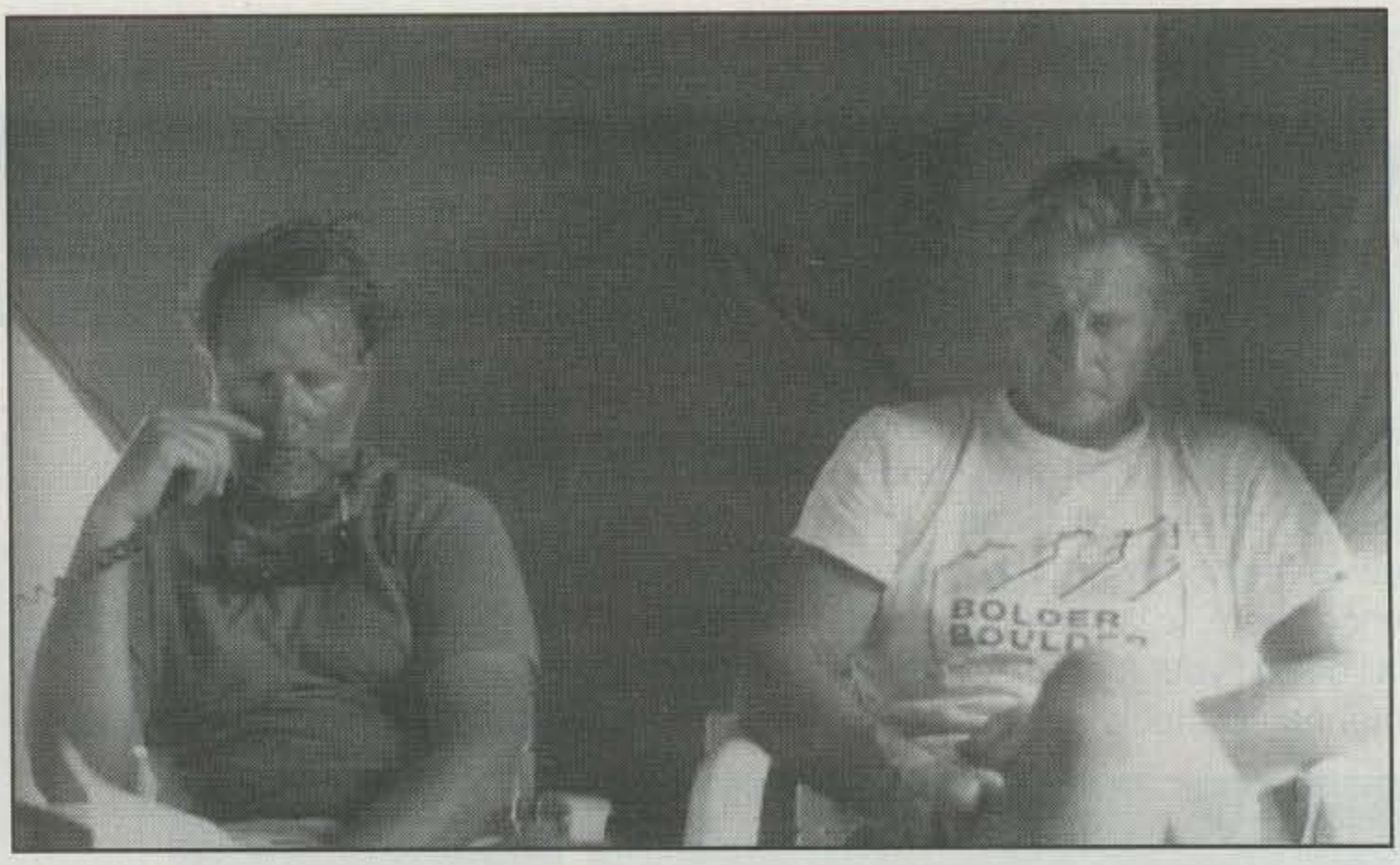
sisting of two flashlights. One large flashlight on the beach was aimed straight out to sea, and another up on the shore atop a 12 foot ladder was slowly rotated. A schedule for five two hour watches of two men each was drawn up. For five minutes, on the hour, we turned on the lights and waited for a signal from the ship that they had fixed their position.

It was at this point that the continuing value of CW for emergency communication was proved to us all. We had exhausted the batteries of the VHF radios aboard the ship, but communication with the ship was critical. The captain was ashore and the ship was dangerously close to the reef. Fortunately, Phil, W9IXX, was now aboard the ship. He used a high-powered flashlight to send Morse signals to Randy, KØEU. They coordinated the night watch and the plan for keeping the tow line perpendicular to the shore. By the time Burt, WØRLX, and I stood our watch at 2 AM, the system was running smoothly. We kept it up each night until our departure.

Sunday was another busy day. While packing continued, a large nylon rope with a pulley system attached was strung several hundred yards between the mast of the ship and the anchor on shore. This system, called a breeches buoy by the Navy, enabled us to off-load some of our gear without risking the Zodiacs. The system worked well, and the crew was finally able to get some food and water to shore. They even sent in a passenger seat, which could have been attached to the line, but there were no volunteers for that ride!

Aboard the ship, Phil had been unable to get the generators going. The batteries were simply too low. He needed one of our generators to recharge them. We decided to risk hooking the Zodiac to the breeches buoy and hauling one of our generators out to the ship over the reef.

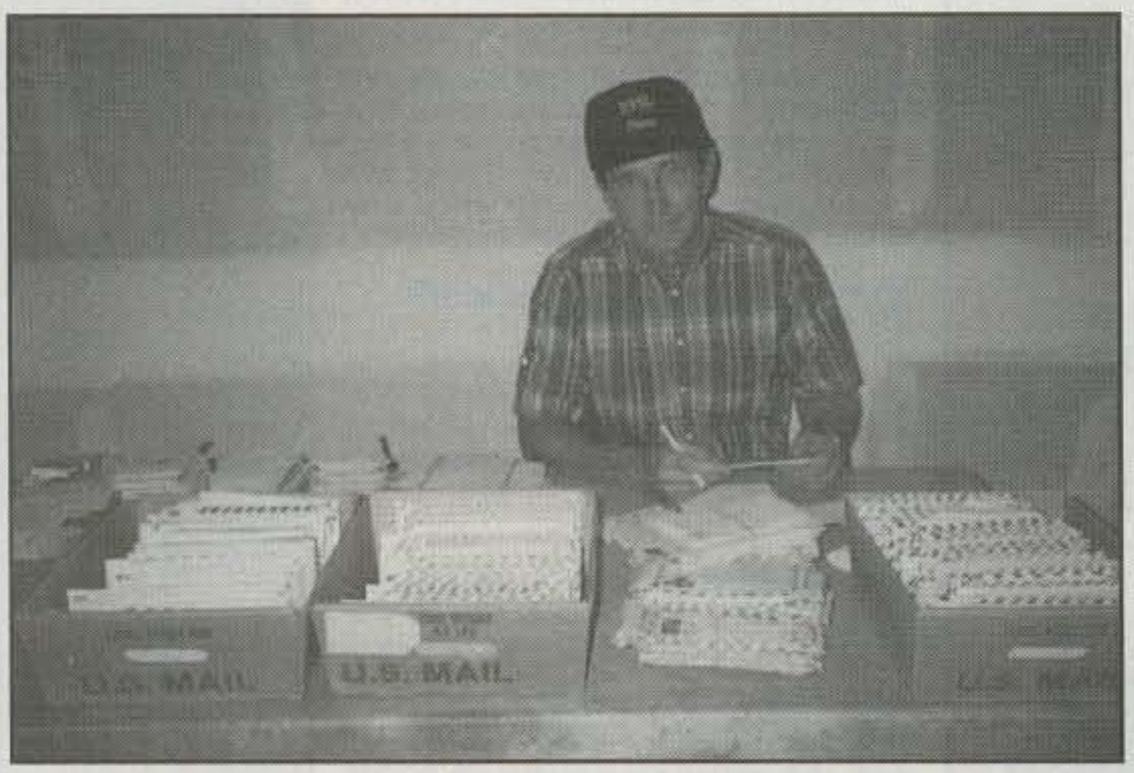


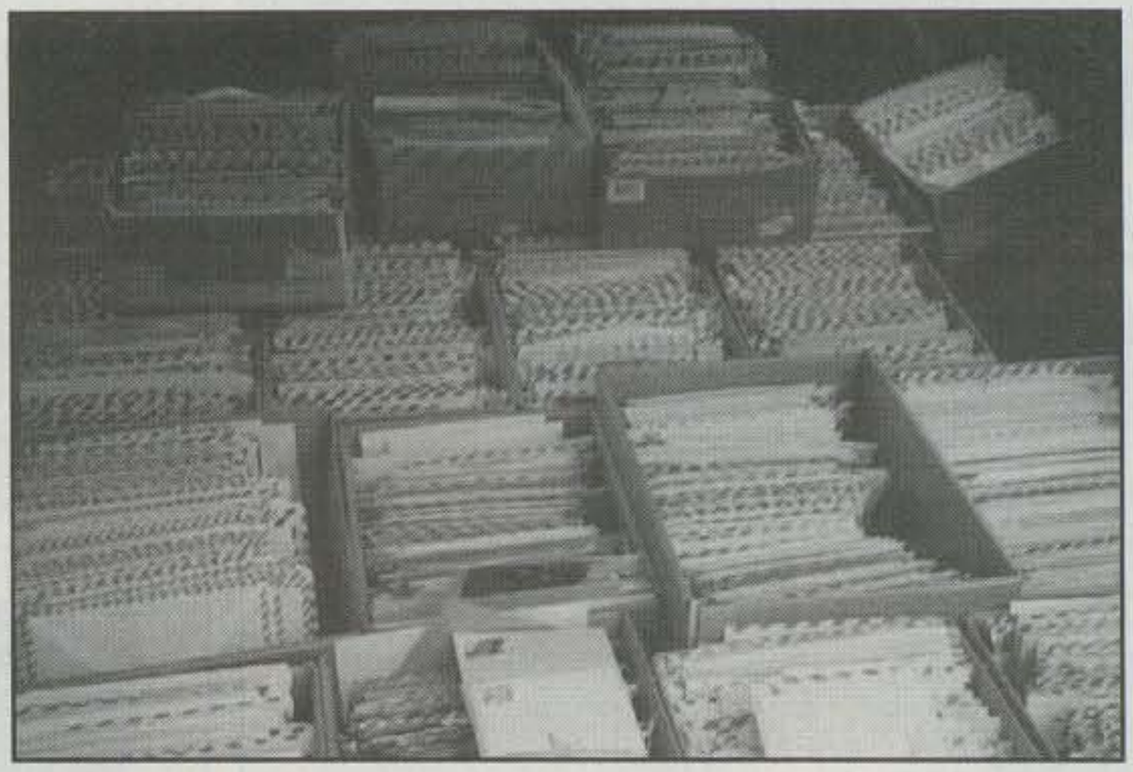
This photo captures the dejected mood of the team during the final days of being stranded on Howland. On the left is Burt, WØRLX, and on the right is the captain of the Machias, *Bill Austin.*

It had to be done at low tide, or the surf might sink the generator and destroy the Zodiac. We decided not to try to send anyone with it due to the risk of being caught by a wave and flipped over.

There was a 6 foot deep pool at the outside edge of the reef. We needed to get the Zodiac safely into that pool before it could be towed out to the ship. We tied a rope to the front corners of the boat. Two people walked ahead of the craft and into the pool to stabilize it while the rest of us walked it over the reef. We lost our balance several times as the waves broke on the reef and swept our feet out from under us. Finally we got it out to the edge and the folks on board the ship successfully pulled it beyond the breakers.

As we were returning to shore, Bob yelled that he was in trouble. An undertow had caught him and was moving him toward the reef wall. He held a hand out to me and I swam over and grabbed it and pulled him into the center of the pool. Moments later we were both caught in another powerful undertow that swept us both to the edge of the pool. This time I was sucked into a hole in the outside wall of the reef. I grabbed onto the edge of the hole, but most of my body was sucked horizontally into it and my head was underwater. Luckily, Bob saw what was happening, and was out of danger himself. He was able to lift my head up a few inches so I could catch some air. Finally, after a few perilous moments, the current reversed itself and spat me out of the hole. Then it was my turn to get the vinegar





When all is said and done, here's the very last part of a successful DXpedition. Steve Larson, N3SL, is shown sorting and answering the thousands of QSL requests for the AH1A operation.

Seven Tips For Good Pileup Technique

1. Be on at the right time. Use propagation aids such as W6EL's Miniprop or magazine charts to tell you when signals will peak to your area.

2. Use your full call. "Last two letters" slows down a well-run DXpedition.

3. Never intentionally transmit on the DX frequncy when he is working split. NEVER!

4. If you find yourself getting annoyed by the antics on the frequency, take a break away from the rig and cool off.

5. When the DX is going by call areas, portables should call with the call area in which they are resident. Do not fabricate a portable callsign.

6. When the DX goes back to a partial or complete call, standby.

7. On CW, always call at least one kHz away from the DX frequency.

treatment for a 6 inch long coral scrape just above the knee of my left leg.

Several hours after getting the generator away, the heavy nylon rope of the breeches buoy exploded from the pull of the ship. The loud boom startled us all. It sounded like a bomb. Luckily, none of the people who were near the line at the time were injured.

We were very aware that any of these minor incidents could have turned into serious situations. Shortages of food and water, problems with the ship, extreme heat, infections, close calls in the surf, and the constant delays were unnerving. But this group remained confident, supported one another and the crew, and kept its cool in the face of these persistent problems. Teamwork and overcoming adversity had become as much a part of the pride of this epic DXpedition as the QSO total.

By late afternoon the seas had settled down enough to risk bringing the Zodiacs ashore. We got several loads of supplies and one of our operators (Peter, ON6TT) off the island before darkness. Now only eight operators remained ashore. We made the final contact with our support team back in Colorado. It was then time to box up the last of our gear.

With all the station equipment packed up there was nothing left to do but wait. Paul, Bob, and I took a walk up to the north end of Howland. There the sea currents come together in a mesmerizing conundrum of huge waves. We faced the sea as the sun set behind the waves and walked back in the dark. It was the only moment of quiet contemplation we had enjoyed since we landed on Howland.

On Monday morning we rose early, packed up the remaining tents, and waited for high tide. The first Zodiac came ashore at around 9 AM, and we worked feverishly for the next two hours getting our gear loaded and off the island. Each run was an exhilarating triumph, because although the surf was still very high, we didn't lose any gear. Two more operators were evacuated. Then the tide went out and we stalled.

We were stuck on the beach at midday with no shelter, quickly frying. Fortunately, a tarp and some aluminum poles were still ashore, and we were able to create a few square meters of shade. The seven of us huddled under that shade like hermit crabs as the sun blazed and the temperature soared to more than 110 degrees. For the next four hours we napped and jostled for shade as the sun moved slowly across the sky.

The final evacuation of Howland began at 3:20 PM local time, Monday, February 8, six days after our scheduled departure date. We conducted a thorough site inspection to ensure that we were leaving the island in the condition we had found it. Ian and Randy were the last to depart Howland, at 4:45 PM.

Cheers went up from the deck as Ian and Randy reached the *Machias*. For the previous six days we had feared for the safety of the crew, ourselves, the equipment, and the boat, as we faced adversity. We could finally relax and relish the success of the operation. The long journey home was underway.

Notes

The AH1A operators were Mike McGirr, K9AJ; Burt Myers, WØRLX; Randy Martin, KØEU; Arie, PA3DUU; Gino, I4ULL; Peter, ON6TT; Bob, K4UEE; Phil, W9IXX; Paul Granger, F6EXV; Ian, G4LJF; and Walt, WØCP.

Congratulations to the many Novices/Techs who worked us on 10 meter SSB. Special recognition goes to the following Novices/Techs who worked AH1A on 15 meter CW: KD6FWY, KC6FWH, KA9TTB, and KB6LEV.

First station worked: JAØEAI on January 26, 1993 at 0905Z.

First calls worked by continental areas: RA9LT at 0906Z; KC4MK at 0908Z; VK3EGN at 0955Z; 5Z4FM at 1300Z; OZ7YY at 1529Z; OA4DSD at 1146Z.

160 meter European QSOs: UW6HIY, UA4WII, LA7JO, 4T4O.

80 meter European QSO total: 268.

The AH1A story is available on video tape. Qualified clubs should contact the Northern California DX Foundation lending library. QSL via Mile High DX Association, P.O. Box 1, Franktown, CO 80116 USA. The author's address is 4150 E. Quincy Avenue, Englewood, CO 80110-5051.

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The 40 Meter Fun Machine

Part V—The Superhet Technique and Transmit Mixer

BY PAUL CARR*, N4PC

I hope that you are enjoying your direct conversion transceiver. The direct conversion technique has many good points. It is simple, and it has good overload characteristics if it is properly designed. It also has some shortcomings.

Since a signal can be heard on either side of zero beat, it produces twice the QRM of a single signal superhet. Another problem that occurs is the detection of strong AM broadcast stations. It is extremely difficult to obtain the mixer balance necessary to eliminate this problem, and since my goal was to build a superhet transceiver, I did not spend a lot of time trying to eliminate this detection. Another problem is to produce an effective AGC circuit. Since all amplification occurs at audio, the automatic gain control function must occur in the audio band, which is not easily accomplished. I feel these problems are best addressed using the superhet technique, and that is the objective of this month's project.

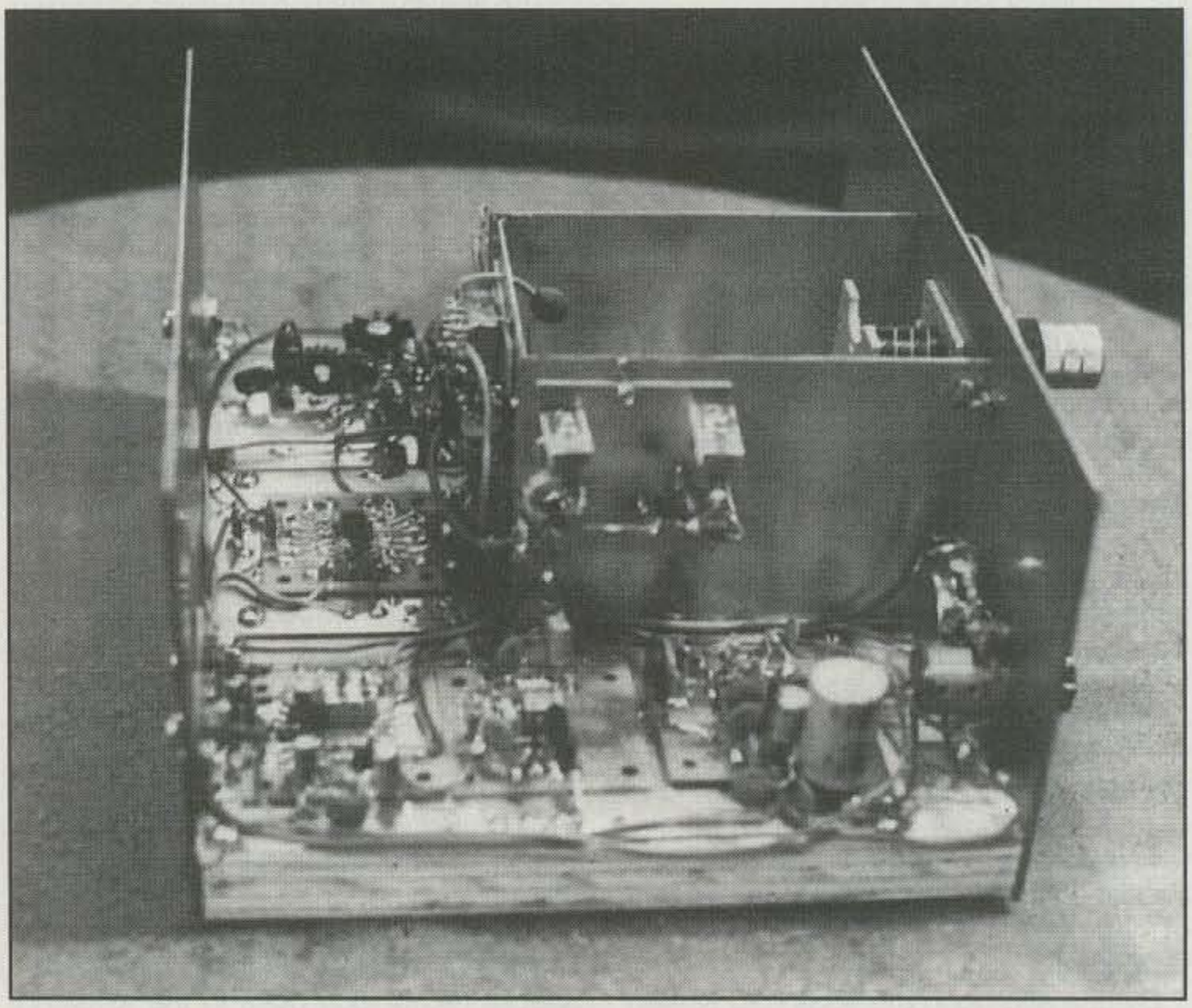
General Design Philosophy

I think it is desirable to look at a brief description of each stage that we are going to build this month.

The Receive Mixer. I have chosen a double balanced mixer that is very much like the product detector from last month's project. The 7 MHz signal from the antenna is mixed with a 3 MHz local oscillator from our VFO (modified slightly) to produce an output of 4 MHz to match the frequency of our crystal filter. Then the mixer is followed by a broad-band amplifier, and the mixer and amplifier produce a net gain of about 10 dB.

The Crystal Filter. Perhaps no other statement produces more fear in the amateur radio fraternity than "We need to build a good crystal filter." I chose a Cohn filter since all the crystals and all the capacitors are the same value. This type of design was first published by Wes Hayward, and it is extremely easy to build and implement. It's easy, as you will see!

The IF Amplifier. The particular IC that I chose for this stage, the MC1350P, has become the standard for home builders. It produces a gain of approximately 45 dB and over 65 dB of gain variation. Its output is matched to the product detector through a broad-band transformer.



This view shows the BFO IF and receive mixers. The VFO compartment can be seen in the center.

The Transmit Mixer. Again, I chose a double-balanced diode mixer for this stage. (It must be obvious by now that I really like this circuit.) The two input signals, 3 MHz from the VFO and 4 MHz from the BFO/Het oscillator, mix to produce an output of 7 MHz. This output is routed to a grounded base amplifier the output of which is tuned to 7 MHz by use of a parallel-tuned circuit. The output of this tank circuit is link-coupled to the transmitter section.

The BFO/Heterodyne Oscillator. A single JFET transistor is used in this

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Say You Saw It In CQ

Parts List (fig. 1)

Resistors (¼ W or greater)

1—10K ohm	2—470 ohm
1—10K var. lin. taper	1—220 ohm
1—4.7K ohm	1—150 ohm
1—2.2K ohm	2—100 ohm
1—1.6K ohm	1—56 ohm
2—620 ohm	1—5.6 ohm

Capacitors (as specified 16V or greater)
8—0.1 uF disc. cer.
1— 1 uF elec. or tan.
4—100 pF 5% poly or silver mica

Solid-State Devices
1—2N3866
1—MC1350P IC
1—SBL-1 double balanced mixer (Mini Circuits Lab)
3—1N914 diodes

Miscellaneous
3—4.0 MHz crystals (Circuit Specialists, Inc., P.O.B. 3047, Scottsdale, AZ 85271-3047)

stage. Ease of construction and good output were the design criteria, and this circuit fulfills those requirements nicely.

VFO Modification. As I implied earlier, the output of the VFO now needs to be at 3 MHz. This requires that we remove the push-push doubler and add an additional capacitor across the frequency generating coil. I have also added a double pi-network output circuit to ensure that no unwanted mixing occurs to spoil the receiver performance.

As you can see, we have quite a few things to do, so let's get busy.

Circuit Modification And Construction

VFO Modification. Start by removing the push-push doubler. (Some parts from this circuit can be used later in the transmit mixer stage.) Next place a 100 pF capacitor in parallel with the existing capacitors across the VFO tank coil. In my case a 100 pF silver mica produced the best frequency stability, but other types may be better for your circuit.

I chose scraps of printed circuit board material to build a

Housing for the VFO. This material is fastened to the front panel using small solder terminals and screws. The sides are soldered to the back, and the ground plane provides mechanical and electrical stability.

The pi-network was positioned on the inside rear panel of the VFO compartment. This circuit was added after the photography was completed, so it does not appear in any picture.

Next set the VFO to 3 MHz by listening to the VFO output with a general-coverage receiver or by routing the output to a

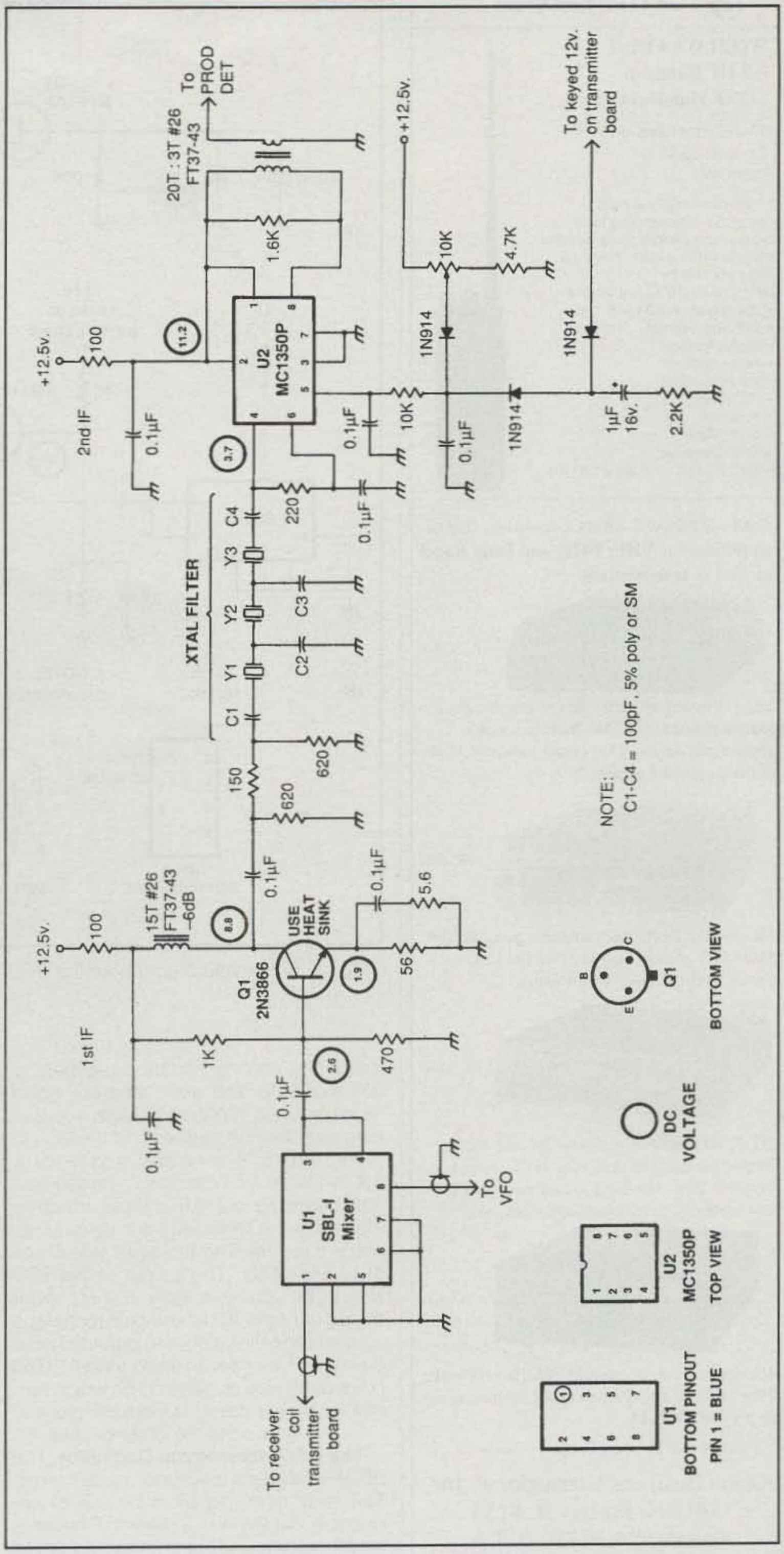

Fig. 1– The schematic diagram for the mixer filter and IF circuits.

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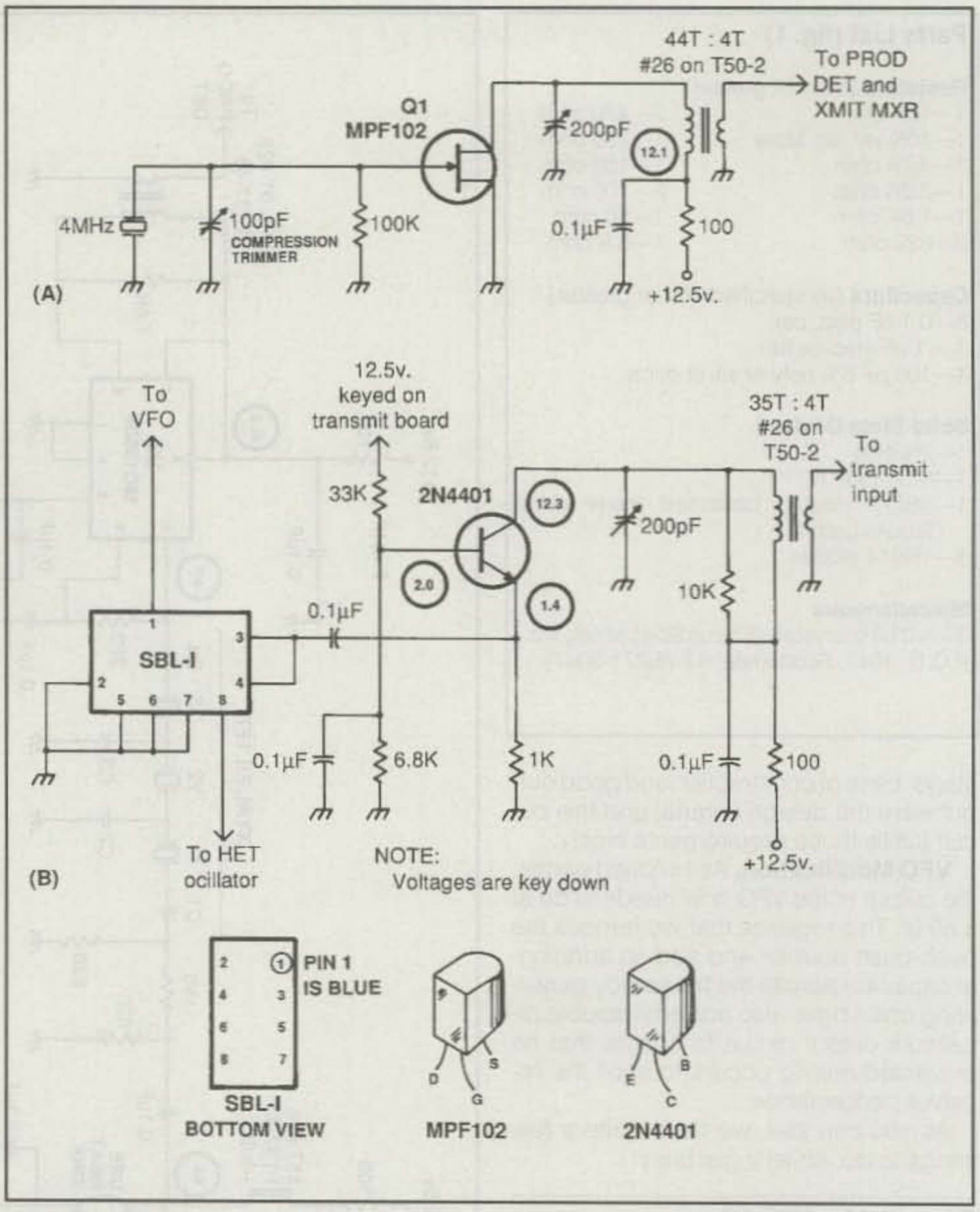

Fig. 2– Schematic diagram for the BFO/ heterodyne oscillator and transmit mixer.

frequency counter. If this equipment is not available and your amateur band receiver tunes WWV on 15 MHz, you can zero beat the fifth harmonic of the VFO to WWV. If a 15 MHz receive frequency is not available, you can zero beat the seventh harmonic to 21 MHz. If you are using the harmonic technique for calibration, place a clip lead on the input side of the pi-network filter. The output of the VFO should be approximately 750 Hz lower during transmit. If the harmonic technique is used for calibration, the output should be either five or seven times as low (3750 Hz or 5250 Hz), depending on which harmonic you are using. Is everything okay?

Great. Now on to the other circuits.

The BFO/Heterodyne Oscillator. The BFO/Heterodyne oscillator is built next. This may seem to be a bit out of sequence, but there is a reason. Choose a small, rectangular piece of scrap printed circuit board (1 inch by 2 inches is large enough). The transistor is supported by the 100K ohm gate resistor and the drain compression capacitor. The source lead is grounded to the printed circuit board material which is used for a foundation.

Parts List (fig. 2)

Resistors (1/4 watt or greater)
1—100K ohm
1—33K ohm
1—10K ohm
1—6.8K ohm
1—1K ohm
2—100 ohm

Capacitors (as specified 16V or greater)
4—0.1 uF disc. cer.
2—200 pF compression trimmer
1—100 pF compression trimmer

Solid-State Devices
1—MPF 102
1—2N4401
1—SBL-1 double balanced mixer (Mini Circuits Lab)

Say You Saw It In CQ

The trimmer in the gate circuit is not installed at this time. Complete the circuit by placing the output transformer and the voltage supply components. Mark each crystal with an identification number. Now temporarily solder one of the crystals from the gate to the small circuit board. Apply voltage to the circuit and adjust the drain capacitor until osciallation starts.

Next check the output frequency with a frequency counter or the station receiver. Note the frequency of the particular crystal. Repeat this procedure for the remaining crystals. Choose the three crystals most closely matched in frequency for the crystal filter. The remaining crystal is chosen for the BFO. This crystal and the gate trimmer capacitor can now be wired permanently. Check the circuit for wiring accuracy. After any mistakes are corrected, place the circuit aside for installation later.

The Crystal Filter. Choose another piece of printed circuit board material (1inch by 2 inches is okay) to use as a foundation for the crystal filter. The three crystals are wired in series and supported by the shunt capacitors. The input/output coupling capacitors are placed as shown on the schematic. Input and output are routed through small shielded cables. That's it. I'll bet it was easier than you thought!

The Receiver Mixer. The receiver mixer is constructed using our proven "modified ugly technique." Prepare a Radio Shack experimenter's circuit by cleaning the copper pads with fine steel wool. Next turn the circuit over and place two layers of electrical tape over the holes in the circuit board. Place a layer of tape on top of the case of the SBL-I double balanced mixer. Then turn the circuit over (pins up) and wire the unit according to the schematic. Be sure to leave enough room for mounting the 2N3866 and its associated components on the experimenter's board. A little thought will produce a scheme that give good results.

After the wiring is complete, test the unit by checking for short circuits as we have done before. After any wiring mistakes are corrected, apply power. The amplifier is biased for about 35 ma, so be sure to place a heat sink on the transistor. The transistor will be warm to the touch under normal operating conditions. Is everything okay? Great! On to the next circuit.

The IF Amplifier. The IF amplifier is built on a Radio Shack experimenter's circuit board similar to other circuits in our unit. Prepare the board as we have done before. Mount an eight-pin mini dip socket on one end of the board. There are enough ground points and components that wire directly to ground to ensure rigid mounting when this unit is placed in its permanent home. Again, perform visual and electrical tests to assure yourself that

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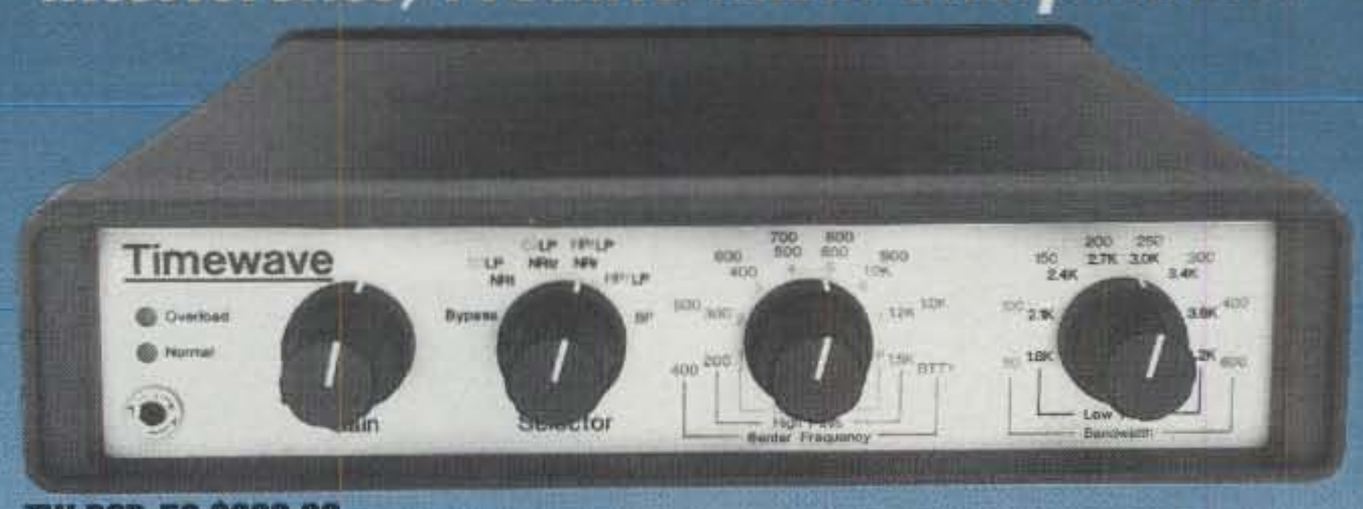

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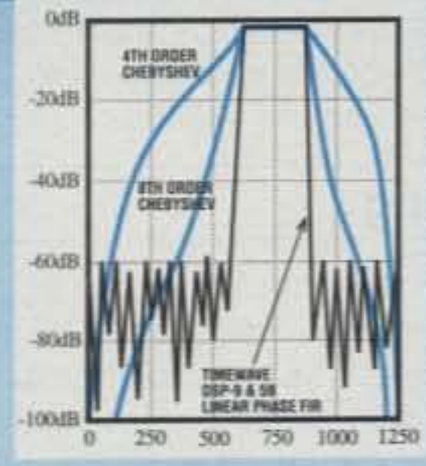

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all is well. When testing is complete, place this unit aside. On to the next circuit.

The Transmit Mixer. The transmit mixer is very similar to the receive mixer except that the output amplifier is a narrow-band amplifier instead of a broadband unit. Also the bias for the 2N4401 is provided by the keying transistor. This ensures that the stage is operational only during transmit. The output tank circuit is link coupled to the transmit level control. If everything checks, we are ready for final assembly and testing.

Final Assembly

You should now have several modules on your workbench that are looking for a home in your transceiver. This is the way to assemble the unit. If you follow this procedure, assembly is easy.

Start by mounting the IF amplifier in the place where the push-push amplifier was removed. Use a small length of shielded audio cable to connect the output of the IF amplifier to the input of the product detector. Connect a piece of the same type cable for connection to the output of the crystal filter. Wire the supply voltage, gain control, and muting circuits as indicated on the schematic. Remember, the IF gain is a linear potentiometer that mounts on the front panel adjacent to the audio gain control.

Now mount the crystal filter. This unit is mounted on the transmitter side of the VFO compartment. Place a small piece of shielded audio cable for input to the filter from the output of the receive mixer.

The receive mixer circuit mounts next. This unit is mounted on the rear wall of the VFO compartment adjacent to the transmitter. Make all connections as indicated on the schematic. Again, check all wiring for errors.

The BFO/heterodyne oscillator also mounts on the VFO compartment adjacent to the receiver section. Connect as indicated on the schematic and check all wiring for errors.

The last unit to mount is the transmit mixer. Place on the transmit ground plane and wire the unit as indicated on the schematic. Check for wiring errors.

Final Testing

If everything has checked, connect the power and antenna. You should be able to hear CW signals as you tune across the band. If the audio doesn't sound natural, adjust the BFO crystal trimmer capacitor (gate circuit) for a natural-sounding tone consisent with good single signal response. If you tune the BFO too far into the passband of the crystal filter, the background noise will sound "mushy," and you will be able to hear signals on both sides of zero beat. Be sure the BFO is adjusted for a crisp tone and good single signal characteristics.

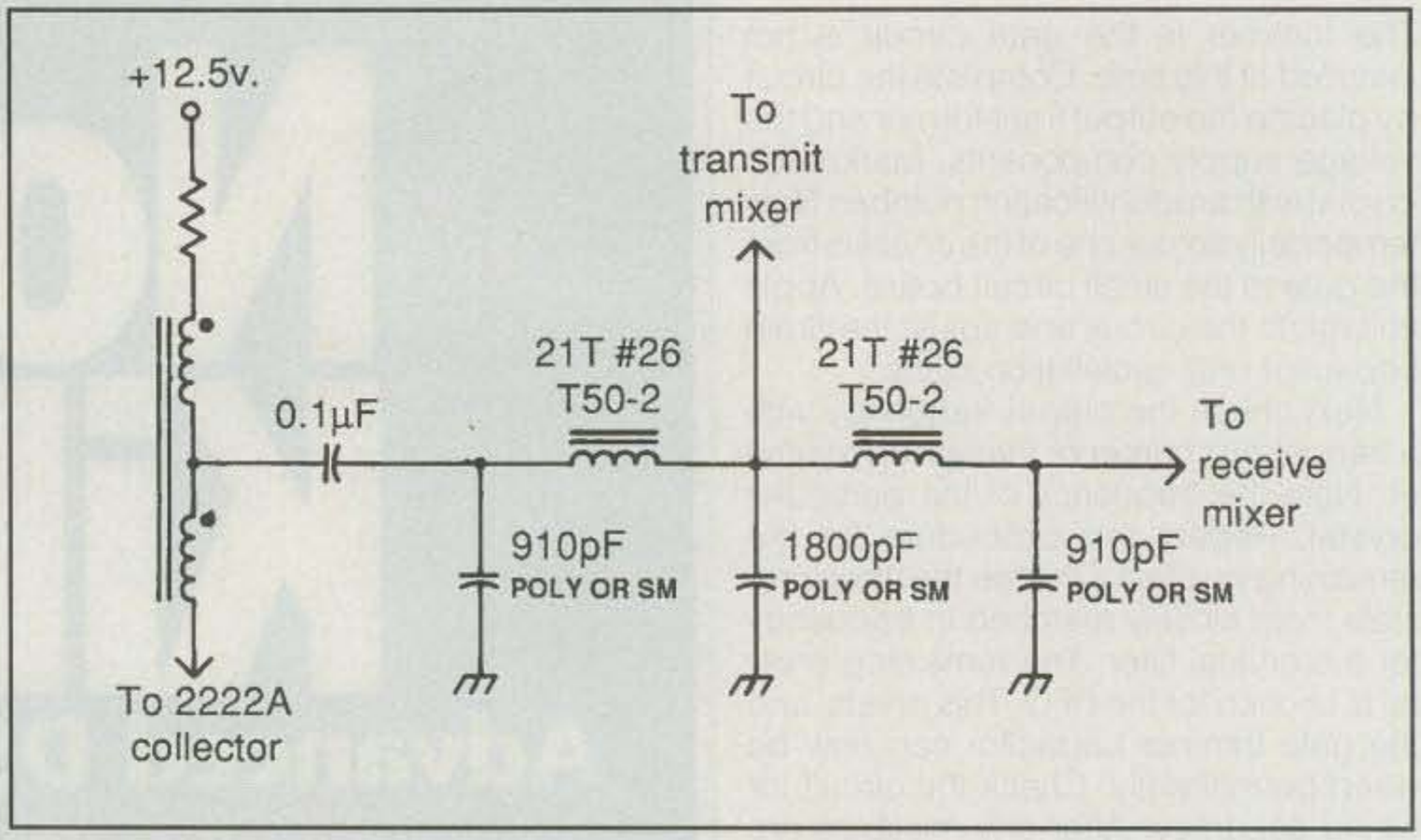


Fig. 3– The VFO output filter.

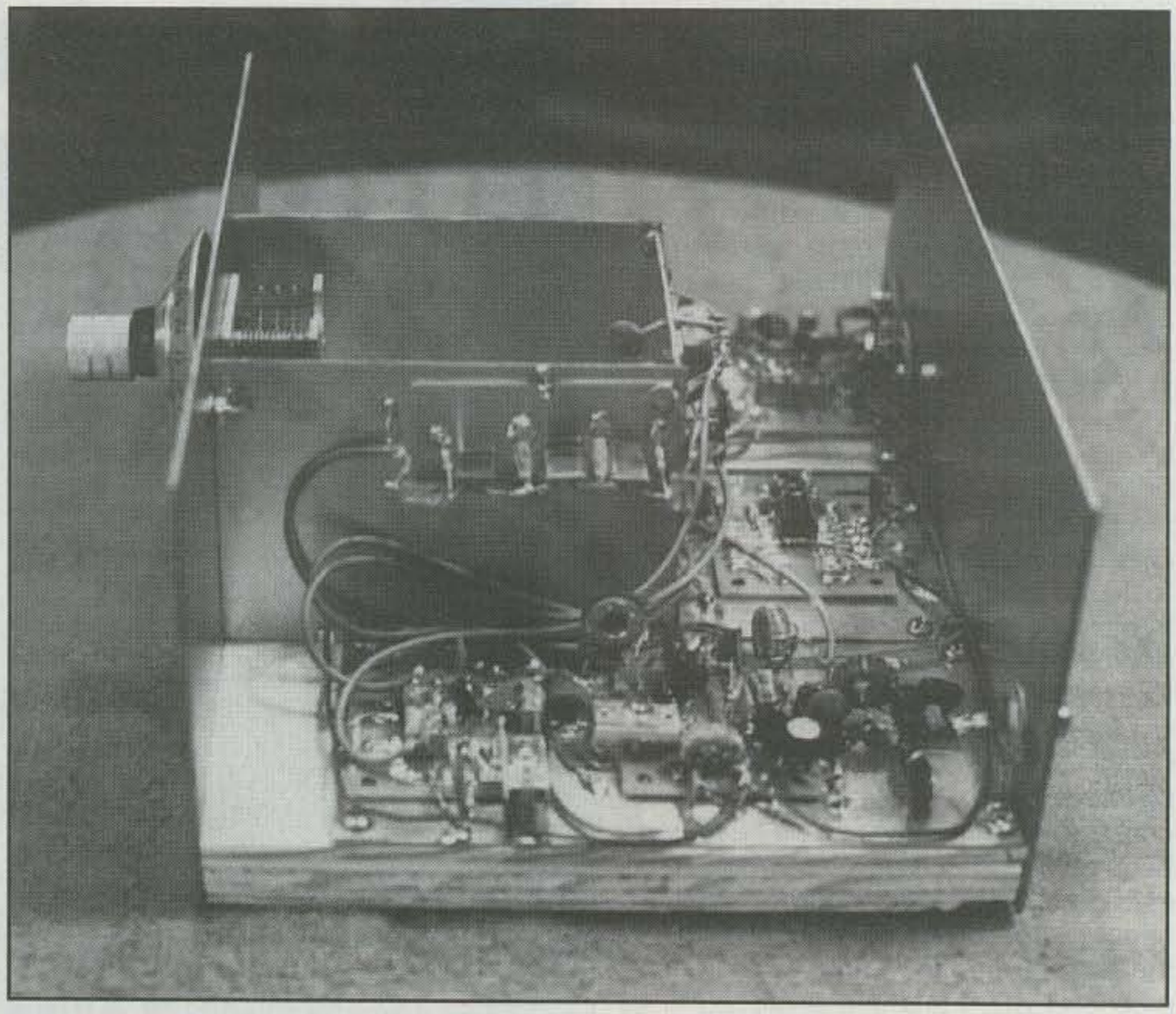
Now for the transmitter section. With a dummy load attached and a level detection device (station receiver, RF probe, oscilloscope, etc.) adjust the mixer tank circuit, driver tank circuit, and driver level control for maximum output consistent with a clean crisp tone. With 12.5 volts my unit produced 1.5 watts output, but your output may be slightly different.

Congratulations! You are now ready to go on the air.

Afterthoughts

As I indicated earlier, this month's project was the most involved of any that we will have. I think you will see the advantages afforded by the superhet design.

If you have questions, please let me know (SASE, please). Next month we will add an AGC circuit and SWR bridge. See you then.



Looking at the transceiver from the other side, we can see the crystal filter and the transmit mixer.

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CQ REVIEWS:

The Ten-Tec Scout 555 Transceiver

BY LEW McCOY*, W1ICP

Once in a while I find a transceiver that really turns me on. The Ten-Tec Scout is just such a rig, and here you will see why.

The Scout is a small, multiband transceiver which measures 2.5"H × 7.25"W × 9.75"D and covers 160 through 10 meters, including the WARC bands.

Ten-Tec has done a very fine job of design in the Scout 555. Often I talk of "bells and whistles," and in many cases these are essentially useless items except as selling points. Ten-Tec has taken a completely different approach in this radio. Only the really needed items are put into this radio, resulting in a selling price of only $495. There were no sacrifices made in reaching this price—at least not in my mind. Let's see what the radio has that makes it outstanding.

There are three modes available: upper and lower sideband, plus CW. There is a built-in Curtis type B iambic keyer with adjustable speeds of 5 to 50 wpm (with full QSK). The LED frequency readout is large, the numerals being over ½ inch high, and reads to 100 cycles. The front-panel controls include **AF** gain, **IF** bandwidth control (essentially the selectivity control), **Mic** Gain control, **RIT** control, **Tune-Off-NB** (NB being noise blanker), **Speed-Off-RIT** switch, and **Power** on/off switch.

On the rear panel is a +13.5 volt input jack. (An external power source of 12 to 14 volts DC, 10 amps is required.) Also, there are **Key** jack and **Key Paddle** jacks, an **AUX** +13.5 volts at less than 2 amps jack, and a PL-259 antenna jack for connecting 50 ohm coax for the antenna or Transmatch. There is a meter switch which selects either **FWD** power or **SWR** on the meter when in transmit.

The final amplifier is designed to work into impedances ranging from 25 to 100 ohms, or an SWR of 2 to 1 or less at 50 ohms. Antennas or feeds with a higher or lower impedance will require a Transmatch.

One of the major features of the Scout is the band-changing arrangement. At the left front of the panel is an area that takes a "band unit plug-in." For example, the 20 meter plug-in unit has "14" stenciled on it. When the unit is plugged in, the LED frequency readout has four places visible, showing, for example, 14 226.7. The transceiver at the $495 price comes with one band provided, whatever band you choose. Other band plug-in units are $25.00 each. This is really unusual marketing, because you buy only what you need.

Front-panel view of the Ten-Tec Scout. The controls are easily identified here.

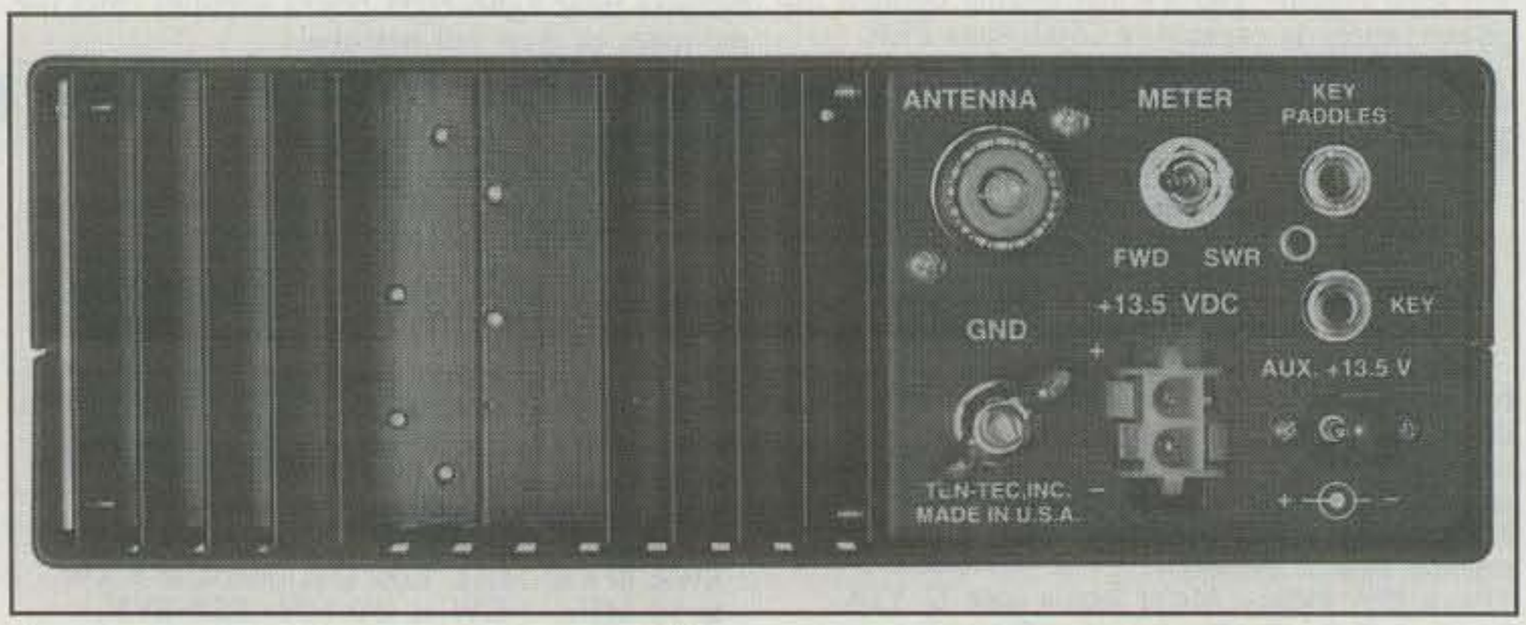
The rig, of course, is ideal for mobile or RV use, and I have found that I, and many of my mobile friends, have never really been interested in working "all" bands. In this case, then, we can buy only what we need.

Some Technical Aspects

The Scout uses an RISC (Reduced Instruction Set Computer) microprocessor to accomplish three tasks:

1. Manage the LED display. The microprocessor controls the gating of the frequency counter and reads the frequency of the local oscillator. It then adds or subtracts the BFO frequency and displays the frequency of the operation.
2. Emulate a Curtis Type B keyer.
3. The most complete task performed by the microprocessor is **FLS**, or Frequency Lock System. This is an unusual mix of a time-tested tunable oscillator design coupled with a modern microprocessor to significantly improve the frequency stability of these very economical oscillators.

The main frequency determining element is **PTO**, the Permeability Tuned Os-



These are the rear connections. The two jack sockets are for a keyer paddle and a regular key. The meter switch at the top center can be switched to read forward power or SWR. When in receive, the meter is calibrated in S-units.

*Technical Editor, CQ, 1500 West Idaho St., Silver City, NM 88061

Say You Saw It In CQ

ASTRON CORPORATION
9 Autry
Irvine, CA 92718
(714) 458-7277 • FAX (714) 458-0826

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

MODEL VS-50M

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES

- LOW PROFILE POWER SUPPLY

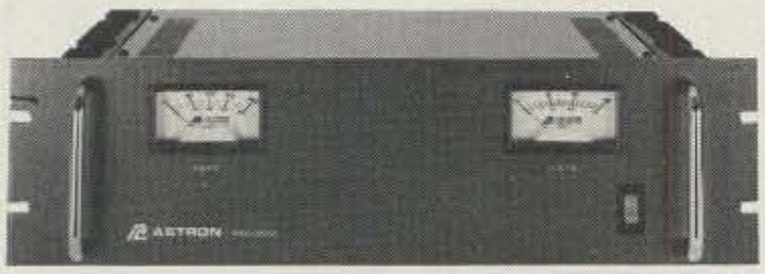
MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
SL-11A	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11S	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13

RS-L SERIES

- POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-4L	3	4	3½ × 6⅛ × 7¼	6
RS-5L	4	5	3½ × 6⅛ × 7¼	7

RM SERIES



MODEL RM-35M

- 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46
RS-70A	•		57	70	6 × 13¾ × 12⅛	48

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46
RS-70M	57	70	6 × 13¾ × 12⅛	48

VS-M AND VRM-M SERIES

MODEL VS-35M

- Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

- Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18
SL-11S	•	•	7	11	2¾ x 7⅝ x 9¾	12

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

A plug-in module for the 20 meter band.

cillator. This oscillator covers 2.2 to 2.7 MHz with a slight overrun. The output of this oscillator is mixed with a crystal oscillator and its output fed to the CPU. The microprocessor compares each frequency reading with the previous reading, and if a difference is in excess of a preset amount, it automatically corrects the PTO by means of a varactor.

RIT

RIT (Receiver Incremental Tuning) is selected by the front-panel switch. The knob is positioned at 12 o'clock for no offset and can be turned clockwise or counterclockwise to help clarify received signals. The frequency display then reflects the change made by the RIT control. Range available is ±1 kHz.

Circuit Description

The local oscillator from the band plug-in module is amplified to +10 dBm to serve both transmit and receive mixers. The received signal is first amplified by a 2N6519, and then the signal is mixed to the intermediate frequency (IF). The IF signal is then mixed with the local oscillator.

The RF amplifier, the 2N6519, is a noiseless feedback amplifier which provides an excellent noise figure. Ten-Tec has been producing what I consider to be very excellent, quiet, low-noise receivers, and the Scout is a good example of their engineering techniques. In my receiving tests I used four different popular transceivers, using the simple process of tuning in a signal and then switching receivers. My conclusion was clear cut: The Scout was outstanding compared to more expensive receivers. It has a very low noise floor, and what surprised me was that it was as good as or better than the other rigs, considering the low price range. In simple language, it is a doggone good piece of equipment.

What about selectivity? There are two crystal filters in the set. One is a four-pole, variable-bandwidth filter (the Ten-Tec Jones filter) which is adjustable from the front panel, and the other is a fixed, five-pole bandwidth filter. The fixed bandwidth filter also has a notch at the BFO frequency to improve the unwanted sideband rejection. Some of the above may be confusing to a non-technical amateur. However, there is one simple test I like to make.

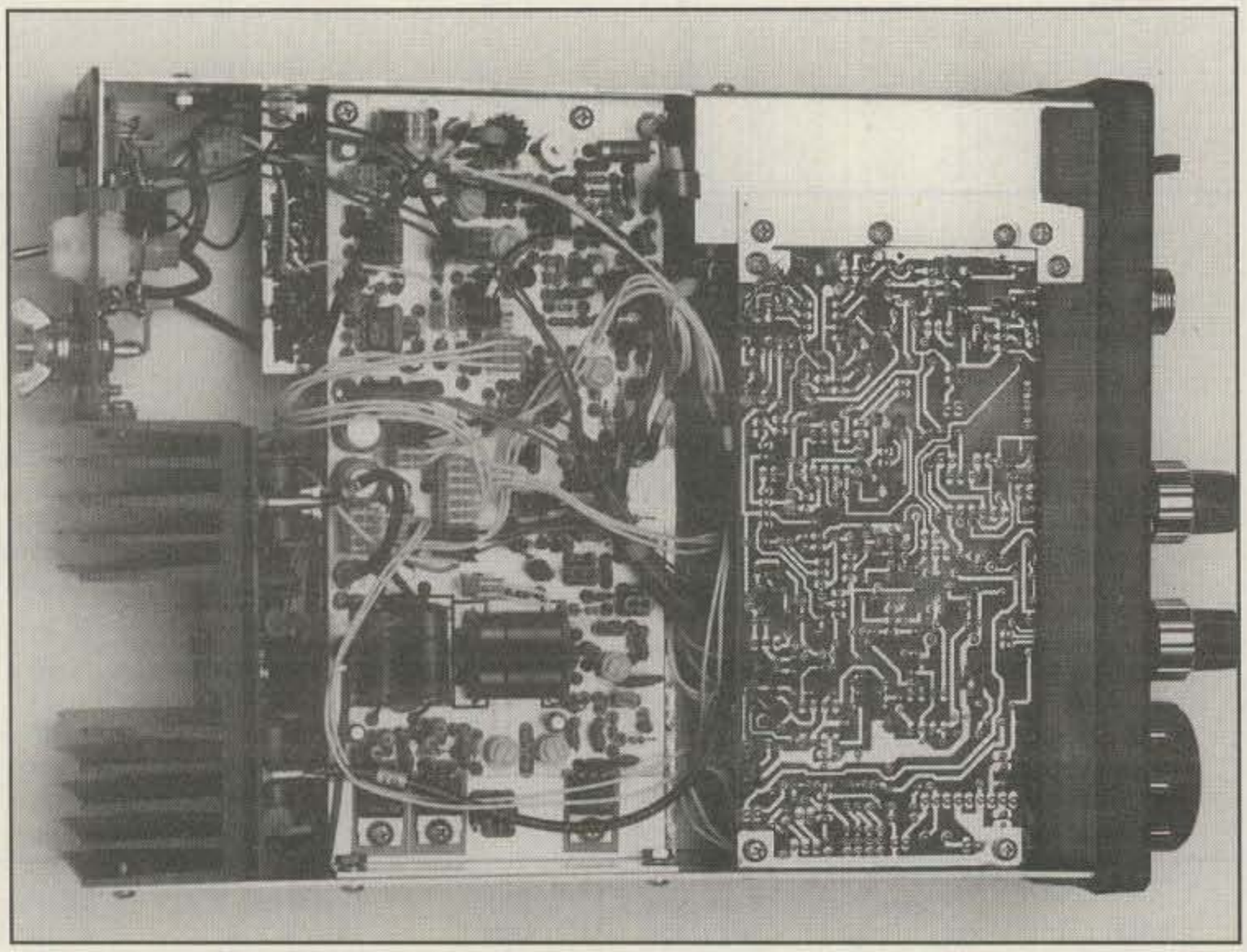
Tune the Scout to a relatively strong CW signal, and set the Jones filter at its widest position. Next start to tune at the zero beat of the signal and extend out to where the signal completely disappears (is no longer heard). Typically, at the widest filter setting I found that a strong signal could be first heard at, say, 14030.5 and would disappear at 14032.5, or a "heard" bandwidth of 2 kHz. At the sharpest Jones setting the same signal would go from 14030.5 and disappear at 14031.1, or a bandwidth of 600 cycles, and by any standard, that is excellent selectivity. I feel this is a "real world" test.

Talking of "real world," I spent many hours on the air asking for reports of my audio, and without exception the reports were of "crisp," "clear," and even "penetrating" audio.

I had also wondered if the fact that SSB was switched automatically for any given band would make a difference, but it was of no importance. This makes me believe that switchable upper and lower sidebands are a thing of the past and hold no real importance anymore.

A bit of history for the newcomer to amateur radio seems to be in order here. When SSB started out, because of the oscillator frequencies, etc., it was normal to have lower sideband emissions on some bands and upper sideband on others. Some amateurs wanted to be able to switch sidebands, and of course this meant more circuitry and more expense. In all my years, and they are many, on sideband there were only one or two times when I needed switchable sidebands, so don't let the lack of switchable sidebands keep you away from the Scout.

Ignition noise is a possible big problem when considering mobile operation. I have a Suburban that is quite noisy on 10 meters. I considered this as good a test as needed. The Scout has a built-in noise limiter that can be switched in or out. I tested it on several signals, and the noise from the car took out signals in the S0 to S7 range. It took a relatively strong signal to overcome the noise. Switching in the noise blanker made S2 and S3 signals perfectly readable, and depending on the engine speed, even made signals that did not move the S meter readable.



Bottom of the transceiver with the cover removed.

CW and The Curtis Keyer

The keyer speed can be set from a few words a minute up to 50 wpm with full break-in. To set the keyer, you switch the speed switch on and send a string of dots. The panel LED readout shows the speed, so you can stop at your desired setting. A sidetone is provided.

Ten-Tec is noted for the CW quality of their products, and this transceiver is no exception. I set up an oscilloscope and checked the make and break characteristics of the signal and found them to be excellent.

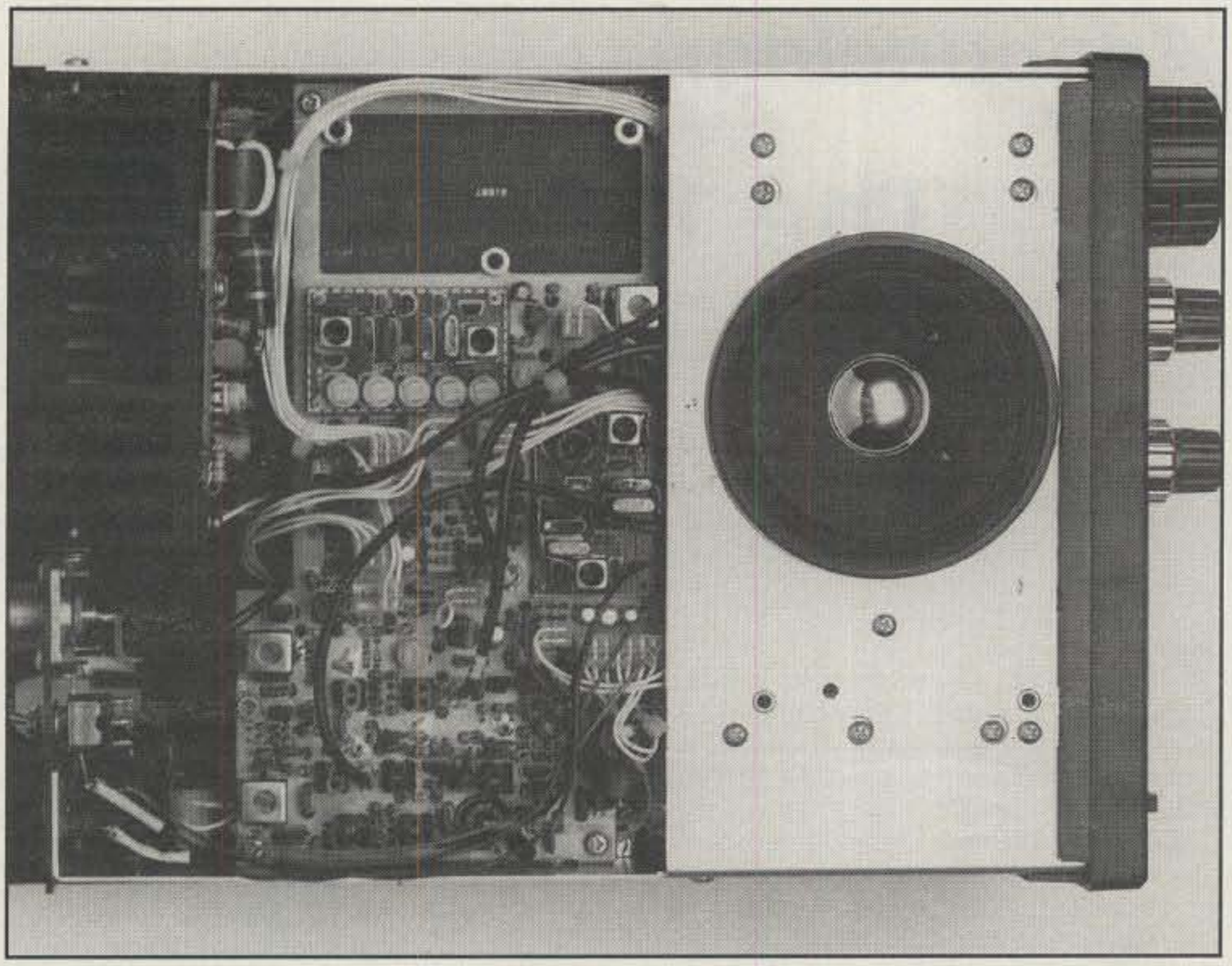
Driving An Amplifier

As Ten-Tec points out in their manual, driving an amplifier with 50 watts is marginal—at least it is for grounded-grid operation. Automatic amplifier switching is not provided, but the knowledgeable amateur can drive a relay via a terminal that is on the control board.

The instruction manual is fully detailed and easy to follow. It is complete with all circuit diagrams plus photos of the boards and rig. Also supplied is a fused power cord, spare fuse, and a four-prong microphone connector in the event you wish to wire a microphone.

Observations

It is, or should be, obvious that I really think highly of the Ten-Tec Scout 555. The transmitter and receiver are very fine performers, and from a cost standpoint, there is nothing on the market that can approach the unit. I once got into QRP operating and managed 100 countries with 5 watts, so 50 watts is really a bucket of power in comparison. I also do a lot of RV travel, and there never is space to spare when traveling by that mode, so the Scout fits in very nicely.

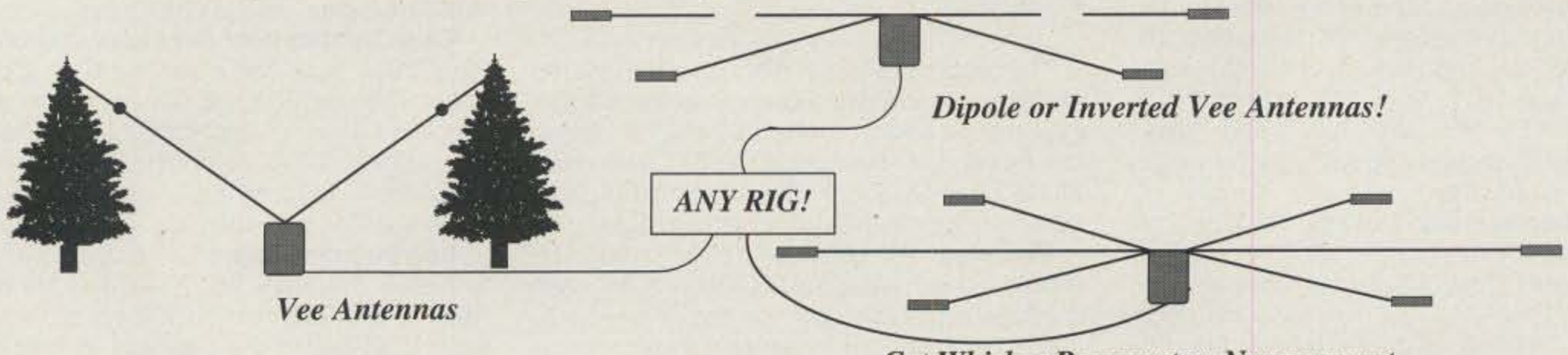


Top view of the Scout showing the speaker panel and the various circuit-board components.

The transceiver is priced at $495.00 with one band module and is available direct from Ten-Tec Inc., Highway 411 East, Sevierville, Tennessee 37862.

3 to 12 dB MORE FROM YOUR DIPOLE, VEE OR LONGWIRE BASE STATION ANTENNA!

SGC's SG-230 computer controlled coupler works with any radio and any antenna system - fixed or mobile, marine or aircraft.



SG-230 SMARTUNER™

SGC's SG-230 Smartuner™ will outperform any built-in antenna coupler on any radio. The reason? The SG-230 mounts AT THE ANTENNA! This means you're matching the precise condition of the antenna - not just loading up a feedline and shunting power to ground. Ask any Smartuner user - this unit delivers great performance on any frequency from 1.8 to 30 MHz. Call for a free package of information from SGC, 1-800-259-7331 or circle our Reader Service number.

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CIRCLE 118 ON READER SERVICE CARD

Announcing:

The 1994 CQ World-Wide 160 Meter DX Contest

CW: 2200Z January 28 to 1600Z January 30
SSB: 2200Z February 25 to 1600Z February 27

The objective of these contests is for amateurs around the world to contact other amateurs in as many U.S. states, Canadian provinces, and countries as possible on the 160 meter band.

Classes: Single and multi-operator only. Use of packet, a spotting net, or logging assistance makes an entry multi-operator. Multi-operators must show the actual operator for each QSO. Under single operator there will be a designation of power level: H = power over 150 watts, L = power under 150 watts, and Q = 5 watts or less. There will continue to be only listings per state or country, but if there is sufficient activity or if a high enough score is made, then a separate certificate will be issued. Minimum score for the separate certificate is 5,000 points! Multi-operators will all be considered high power.

Exchange: RS(T) and state for USA, province for Canada, and either prefix or country abbreviation for DX. Contacts without some location indicator will be ruled invalid.

Scoring: Contacts with stations in own country, 2 points. Contacts with other countries on same continent, 5 points. Contacts with other continents, 10 points. *Maritime mobile contacts count 5 points. There is no longer any multiplier value for a maritime mobile contact.*

Multiplier: Each continental U.S. State (48), Canadian area (13), and DX Country. KL7 and KH6 are considered DX and not states for this contest. DX countries are DXCC plus WAE (IT, UA1N, GM Shetland Islands, et al). Canadian areas include VO1, VO2, NB, NS, PEI, VE2, VE3, VE4, VE5, VE6, VE7, NWT, and Yukon. Remember that maritime mobiles no longer count as a multiplier.

Final Score: Total QSO points times the sum of all multipliers (states, VE, DX countries).

Penalties: Three additional contacts may be deleted for each unacknowledged duplicate or unverified contact removed from the log.

Disqualification: A log may be disqualified for violation of amateur radio regulations, unsportsmanlike conduct, or claiming excessive duplicate/unverified contacts or false multipliers. If the corrected score without penalties shrinks more than 3%, disqualification will be considered. A warning may be issued if an entry borders on disqualification, and the calls of those warned or disqualified will be printed with the results!

Awards: Certificates will be awarded to the top scorers in each class by state, Canadian area, and DX country. Runners-up with high scores over 100,000 may also receive certificates. Low power or QRP entries may also receive certificates if there is sufficient activity or the score is outstanding. The following plaques, with donating sponsors as indicated, will be awarded for exceptional efforts.

1994 PLAQUES
SINGLE OPERATOR

	CW	SSB
World (N5JJ Memorial)	K5AAD	K5AAD
USA	K4TEA	K4JRB
Canada	W8BLA	K5NA
Zone 3 USA	KM4MG	N4ONI
Zone 4 USA	K5NA	KC4MJ
Zone 5 USA	WA4CUG	K4ODL
Europe	K4UEE	N4NX
Africa	K4SB	WB4ZNH
Oceania	K4TKM/6	K4DLI & KB4SSS
Asia	NE4S	W4LVM
Japan*	WØZV	—
S. America	K4JAG	KL7JAR/4

MULTI-OPERATOR

World	N4RJ	Southeastern DX Club
USA	WS9V	WB9Z

**There is no SSB operation allowed in Japan at present.*

The procedure for the plaques is that the top scorer in the indicated area wins the plaque. However, a station can only win one plaque per mode. For example, if WX8ZZZ wins top World Multi-Operator, then the next highest scoring station in the U.S. wins the U.S. plaque.

Volunteer DX Window: 1830 to 1835 kHz should be left clear for DX stations for intercontinental QSOs in both contests. Please note this is volunteer but essential if the contest is to continue to attract rare DX as entries. DX stations will specify a listening frequency outside the window. Let's all make this work and increase our scores! This is a gentleman's contest and band, so let's help make intercontinental contacts happen.

Computer Logging: Please send us your computer disk. IBM, MS-DOS compatible disks are encouraged. The format we prefer is your CT.Bin or NA.Bin file. If you use a program different from the one mentioned above, the generic format should contain a vertical single column of calls in chronological order. The committee will require, on request, a disk for any possible high score, provided that the paper log or dupe checking material as originally submitted was a computer printout. The outside of the disk should be clearly labeled with the call of the entrant, the files included, the mode (SSB or CW), and the category. Disks **must** be accompanied by a paper log satisfying all logging instructions.

Manual Logs: Sample log and summary sheets may be obtained from *CQ* by sending a large SASE with sufficient postage to cover your request. You can make your own with 40 contacts per page with columns for GMT, exchanges, multiplier, and points.

Dupe/Check Sheets: All logs over 200 contacts must provide a check sheet or dupe list. A check sheet or dupe list is a list of all calls in alpha sorted order.

For All Logs: Show the multiplier only the first time it is worked. Each page must have sub-totals for multipliers, contacts, and points. A running total below the sub-total on each page is recommended. Dupe or check sheets with every entry are requested and are required with over 200 QSOs. Include a summary sheet with your entry showing the scoring and other essential information. Include a printed name/mailing address and a signed declaration that all rules have been observed. Please put the summary sheet at the front of the log. All logs should clearly indicate total multiplier, W/VE multiplier, and DX multiplier.

Club Competition: Any club that submits at least three logs can enter the Club Competition. The name of the club must be clearly identified under club competition on the summary sheet. Club competition is a "for fun" competition to foster more activity. There is a separate listing for the club scores.

Log Submissions: Mailing deadline for CW entries is February 28, 1994, and March 31, 1994 for the SSB section. *Exception:* You may send both logs in one package as long as the CW log is received by March 31, 1994. Please try to mail early to assure receipt. The best way to get a return receipt is to enclose an SASE or SAE with postage or 1 IRC. Please avoid the registered postal route, as this delays getting the log until someone can sign the receipt! Finally, please proof read your log before submission. Each year many errors are corrected that you should catch! Logs or sections of a log that are unreadable will be disqualified.

Send all logs to 160 Meter Contest Director David L. Thompson, K4JRB, 4166 Mill Stone Court, Norcross, GA 30092 USA. **Please indicate CW or SSB on the envelope.**

Say You Saw It In CQ

MFJ HF/VHF SWR Analyzer™

. . . Read your antenna SWR from 1.8 to 170 MHz continuously . . . built-in 10 digit LCD frequency counter. . . smooth vernier tuning . . .

MFJ-249 **$199.95**

MFJ-249 handheld *Univeral SWR Analyzer™* lets you read your antenna SWR from 1.8 to 170 MHz quickly and easily without any other equipment!

Has built-in 10 digit LCD frequency counter and smooth vernier tuning.

You get *three* instruments in one . . . high accuracy frequency counter . . . RF signal generator . . . *SWR Analyzer™*.

Measure antenna resonant frequencies and 2:1 SWR bandwidths. Adjust mobile antennas, antenna tuners and matching networks in seconds.

Measure feedpoint resistance, inductance, capacitance, resonant frequency of tuned circuits, transmission line velocity factor/ impedance/ loss. Test RF chokes, transformers, baluns.

Use 8 AA cells or 110 VAC with MFJ-1312B, $12.95. 4x2½x6⅛ inches.

MFJ-209, $109.95, same as MFJ-249 less frequency counter.

See *free* MFJ catalog for complete line of MFJ SWR Analyzers™.

MFJ-949E 300 W Tuner

MFJ-949E **$149.95**

World's most popular antenna tuner covers 1.8-30 MHz, has lighted *peak*/average Cross- Needle SWR/ wattmeter, 4:1 balun for balanced lines and *full size* 300 watt dummy load.

Versatile 8 position antenna switch lets you *pre-tune* MFJ-949E into dummy load to minimize QRM.

Custom inductor switch was carefully engineered to withstand extreme voltages and currents.

Cabinet is chemically etched to MFJ's bond tough *baked-on* paint.

VHF/HF Packet TNCs

MFJ-1270B **$119.95**

MFJ-1270B *super* TAPR TNC clone has a world wide reputation as *the most reliable packet TNC in the world* -- many work 24 hours a day for years without a single failure!

Fully TAPR TNC-2 compatible, VHF *and* HF operation, *free* AC power supply, new *enchanced* mailbox expandable to 512K with auto/reverse mail forwarding, WeFAX mode lets you print weather maps, optional plug-in 2400/9600 baud modems, KISS interface, MFJ Host mode.

MFJ TNC/Mic Switch

MFJ-1272B **$34.95**

MFJ TNC/Mic Switch lets you switch between your TNC or microphone by pushing a button!

Just plug pre-wired cables into your rig's mic connector and TNC.

Plug-in jumpers let you use nearly any rig with 8 pin mic connector.

MFJ-1272B, $34.95 /MFJ/TAPR TNC2 clones; **MFJ-1272BX**/PK-232; **MFJ-1272BYV**/KAM VHF/KPC3; **MFJ-1272BYH**/KAM HF Port; **MFJ-1272BZ**/PK-88, $39.95 each.

Regenerative RCVR Kit

MFJ-8100K **$59.95**

Build this *regenerative* shortwave receiver *kit* and listen to shortwave signals from all over the world with just a 10 foot wire antenna.

Has RF stage, vernier reduction drive, smooth regeneration, five bands.

MFJ-8100W, $79.95, assembled.

MFJ-1278B Multi-Mode Data Controller

MFJ-1278B **$299.95**

Use this MFJ-1278B, your transceiver and computer to transmit and receive digital communications! You'll discover a whole new world of ham radio and communicate in ways you never knew existed on our ham bands.

The *world class* MFJ-1278B Multi-Mode and MultiCom™ software is packed with features *no other* multi-mode gives you.

You get *10 digital modes* . . . Packet, AMTOR, PACTOR (at no extra cost), RTTY, ASCII, Navtex, Color SSTV, 16 Gray Level FAX, CW and Memory Keyer plus an *enchanced* 32K Mailbox.

You'll have fun joining worldwide *packet* networks and exchanging *color SSTV* pictures with your buddies around the world. You'll marvel at *full color FAX* news photos as they come to life on your screen. You'll see weather changes on highy detailed *weather maps* in all 16 gray levels. You'll eavesdrop on late breaking news as it happens on *RTTY*. You'll enjoy error free HF QSOs on *PACTOR* and *AMTOR* and receiving packet mail in an *enchanced 32K mailbox*. Want to copy some *CW*? Just watch your screen.

MFJ-1289, $59.95, MultiCom™ software and cables.

MFJ *halfwave vertical* Antenna

6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed!

MFJ-1796 **$199.95**

Operate 6 bands -- 40, 20, 15, 10, 6 and 2 Meters --with this MFJ-1796 *ground independent* halfwave vertical antenna! No radials or ground ever needed!

It's only 12 feet high and has a *tiny* 24 inch footprint! You can mount it anywhere from ground level to the top of a tower -- on apartments, condos, small lots, even on motorhomes. Perfect for vacations, field day, DX- pedition, camping.

Frequency selection is fully automatic -- all you do is transmit. Its *low angle of radiation* really reachs out and brings in DX. Omni-directional. 1500 watts PEP.

Efficient *end loading*, no lossy traps. *Entire length* is always radiating. *Full size* halfwave on 2 and 6 Meters. High power *air-wound* choke balun eliminates feedline radiation. Adjusting one band has minimum effect on other bands. Add $20 s/h.

Easy to assemble -- you'll have it on the air in an afternoon.

MFJ's *world famous* 3 KW Versa Tuner V

MFJ-989C **$349.95**

Here's why the MFJ-989C is the finest 3 KW antenna tuner money can buy . . .

Two *massive* 250 pf transmitting variable capacitors can handle *amps* of RF current and *6000* RF volts. Logging scales.

Precision ball bearing roller inductor, three digit turns counter and spinner knob give you exact inductance control for minimum SWR.

Lighted *peak*/average Cross-Needle SWR/Wattmeter has 200/2000 watt ranges. Super heavy duty *current* balun has two giant 2½ inch powder iron toroid cores wound with *Teflon*® wire.

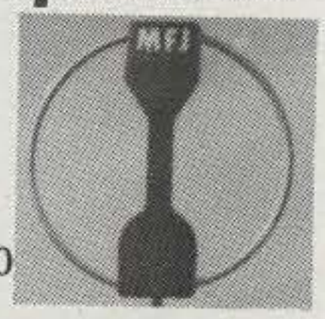
Six position *ceramic* antenna switch has extra large contacts. Flip stand, dummy load, one year *unconditional* guarantee, aluminum cabinet, tough *baked-on* paint, locking compound on nuts/bolts, handles 3 KW PEP, 10⅛x4½x15 in. Meter lamp needs 12 volts. Add $13 s/h.

MFJ *No Matter What*™ Guarantee

MFJ's famous one year *No Matter What™ unconditional* guarantee means we will repair or replace (at our option) your MFJ product sold in this ad *no matter what* for a full year.

Super Hi-Q Loop Antenna

MFJ-1786 **$249.95**



Tiny 36 inch diameter high efficiency loop antenna covers 10-30 MHz *continuously* with low SWR. Handles 150 watts.

Ideal for home installations where space is limited -- apartments, condos, small lots. Take on trips.

All welded construction.

Remote control has *Automatic Band Selection™*, Cross-Needle SWR/ Wattmeter. No control cable needed. Use batteries or 110 VAC. Add$20 s/h.

No ground or tuner needed.

MFJ-1782, $219.95, like MFJ-1786 but remote control has only slow/fast tune buttons.

Dual Band Mobile Ant.

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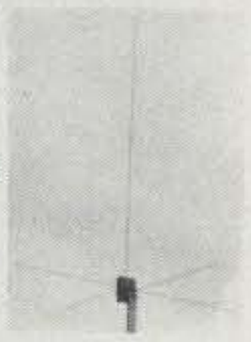

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Once more into the fray! W1ICP enters the antenna arena in this two-part series on comparing quads and Yagis.

One More Time
Yagis Versus Quads, Log Periodics, And Others–Part I

BY LEW McCOY*, W1ICP

Since the advent of computer programs for configuring antenna patterns and gain, the discussion of what is the theoretically best rotary directional antenna has resurfaced. Recently I reviewed a five-band quad ("The Lightning Bolt Quad," *CQ*, April 1993), which got me thinking about the interesting comparison of quads versus Yagis.

I have lectured on the subject more times than I can remember. As far as I know, I have read and studied all the articles on quads and Yagis that I have come across. I know Bill Orr's *Cubical Quad* book by heart and have used it to build several quads. In addition, I have designed many quads and delta loops (as well as Yagis and trap beam antennas). I have had and used many Yagis and many quads, so I guess I can write about them with some authority. And before I forget, *CQ* has just published a very complete book on quads, *The Quad Antenna,* by Bob Haviland, W4MB, an amateur who knows the subject extremely well. Every quad man or anyone interested in putting up a quad should read it. (It is available from *CQ* for $15.95 plus $2.50 shipping and handling.)

Let's first discuss a little history, as I always feel our readers are interested in background material. Basically, the idea of a directional beam antenna using parasitically excited elements was first discussed by Yagi and Uda, two Japanese scientists. (There were directional multielement beams before this time, but it was customary for all elements to be "driven" or directly connected from the generator or transmitter.)

Yagi and Uda set down the concept of using more than one half-wavelength antenna element to obtain directional patterns. One antenna element was "driven" in that the feed line was attached to it from the transmitter. By spacing another dipole a certain distance behind the driven element, this second element was excited by the field from the driven element (see fig. 1). Power was fed with a direct connection to what we now define as the "driven" element. It was found that by using two elements, one driven and the other parasitically excited, a four to five decibel gain could be achieved in the desired direction as compared to a single dipole. In addition, signals coming from several directions could be attenuated, giving us what we call "front-to-back and front-to-side" signal attenuation.

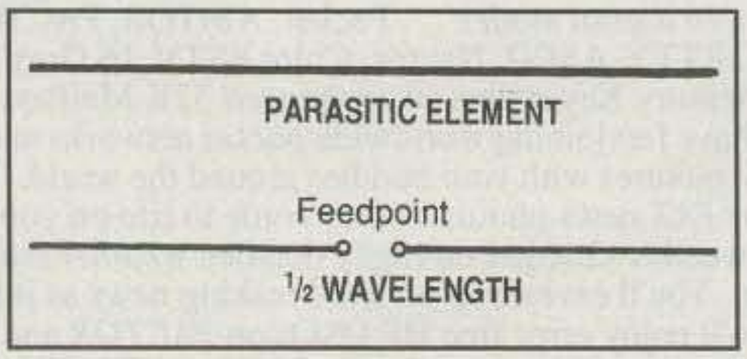

Fig. 1– The original design of the Yagi consisted of a dipole driven element, with a parasitically excited dipole to the rear.

Let's stop here and define the type of gain discussed in this article. One hears of many types of gain figures when antennas are discussed. However, there are really only two basic methods of expressing gain in antennas. In engineering, an isotropic radiator is used as a basis of antenna gain comparisons, and the gain is expressed in dB (decibels).

Unfortunately, an isotropic radiator is not a real antenna, but a theoretical one. An isotropic antenna is calculated to radiate energy equally well in all directions. The sun would be a reasonable example or analogy, but even the sun doesn't radiate equally in all directions It is, however, a close approximation to an isotropic antenna.

A half-wavelength dipole at resonance has a figure-eight pattern of radiation, with two major lobes on each side (broadside) to the dipole. The gain in these lobes is on the order of 2.14 dB as compared to an isotropic antenna. In other words, our isotropic antenna is theoretical unity, and we go up (or down!) from there.

The amateur must realize, however, that in comparing gains, comparisons of a real antenna to an isotropic antenna provides bigger numbers. A three-element monoband Yagi would have on the order of 7 dB gain as compared to a dipole 7 dBd (note that last "d" in dBd; it means dipole). If we compare the Yagi to the isotropic we would add 2.14 dB and come up with 9.14 dBi, the "i" meaning isotropic. Amateurs like to get the most gain for their money, so it is wise to know what is being compared to what. In this article, all the gain figures mentioned are in dBd—dipole comparisons.

Getting back to our discussion of beams, as more parasitic elements were gradually added to the Yagi concept, the gain of the beam increased. Usually, there was one slightly longer element used (a reflector), and slightly shorter elements (directors) were also used. Again, these added elements are all what is known as "parasitically excited." It was found that a driven element used with a reflector and director would shape the signal into a directional pattern that had approximately 7 dB of gain compared to a single driven element or single resonant dipole. The driven, reflector, and director elements were all on the order of one-halfwave long in overall length, the reflector being slightly longer and the director slightly shorter.

One other important point for newcom-

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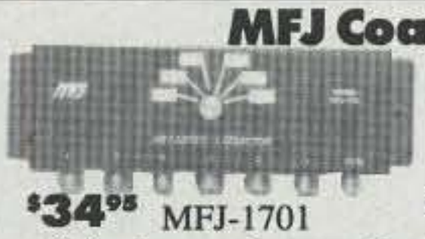

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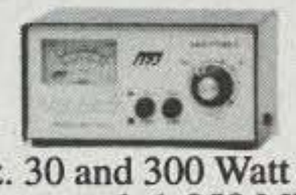

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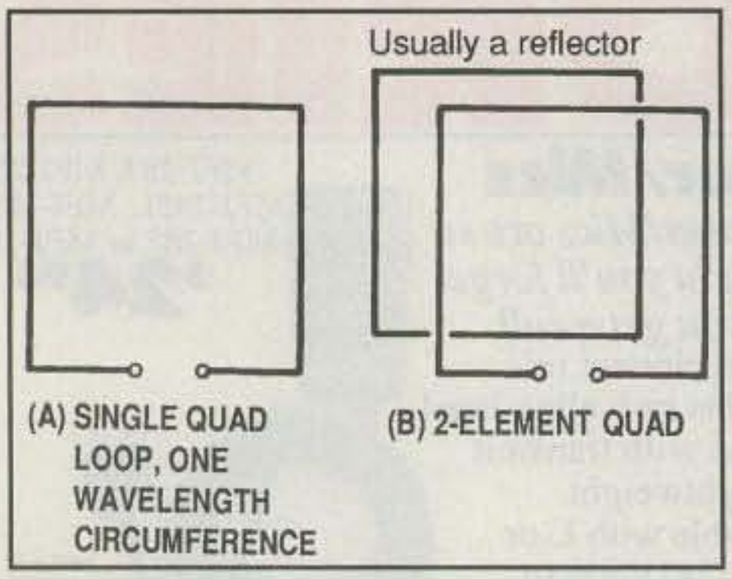


Fig. 2– The quad loop can be used in a square configuration or as a diamond. The single loop has a feed impedance of approximately 100 ohms. This antenna has a measured gain of 1.8 dB as compared to a dipole, or almost 4 dB as compared to an isotropic radiator.

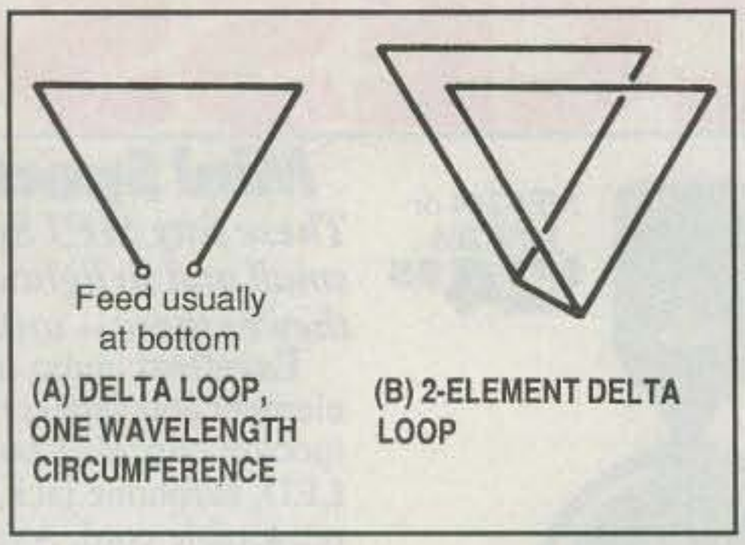


Fig. 3– At (A) is the basic Delta loop, normally fed at the bottom and used with a gamma match. The impedance without matching is slightly more than 100 ohms. At (B) is a beam configuration. Actual construction details can be found in the ARRL Antenna Handbook.

ers to consider when discussing beams. A three-element monoband beam will produce about 7 dB. Many amateurs believe that they can obtain much higher gain simply by doubling the size of the beam. In other words, if a three-element beam provides 7 dB gain, then a six-element beam will provide 14 dB gain. I hear this on the air and my hair starts to stand on end! There is a rule, and while not completely exact, it is certainly good enough to be depended on. If you double the number of elements *and the length of the array*, you can usually expect to get a 3 dB increase in overall gain—in other words, about 10 dB gain as compared to a half-wavelength dipole. Three dB is not insignificant, because that really means doubling the effective power in the best direction. Keep this rule in mind, though: To go from 10 dB to 13 dB, you must again double the size of the array, either with a very long array or stacked beams.

To repeat, from this original design we come up with the Yagi-type beam, which usually consists of three elements that have a gain on the order of slightly more than 7 dB compared to a dipole. This is for a single band beam, not the popular multiple-band trap beam. I'll attempt to discuss multiband beams, traps, etc., in a moment, but for now let's think single bands.

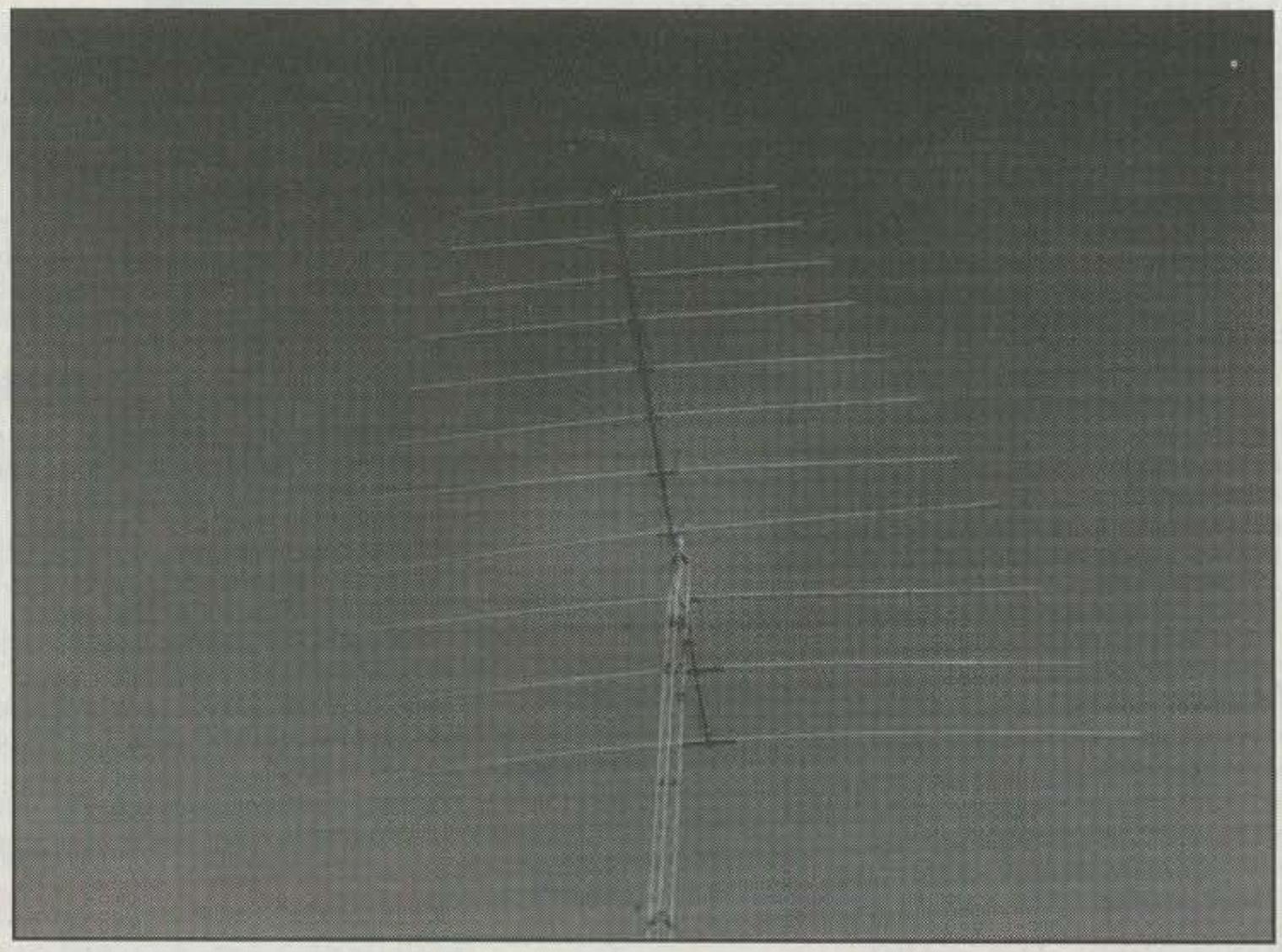
Just after WW II, an amateur named Clarence Moore, W9CLF, designed a different "Yagi" type beam, which at the time was really a new concept in rotational directional beams. What Clarence designed was what we now know as the "quad." The basic quad consisted of a square-shaped driven element one wavelength in size (the normal Yagi uses one-half wavelength elements) with a parasitically excited one-wavelength reflector element added—in other words, a two-element beam (see fig. 2[A] and [B]).

The Yagi-Uda type beam described above consisted of what some of us refer to as "High Q" elements, and the RF voltages at the ends of the elements could be (and are) very high. Shortly after WW II Clarence Moore was working at a station in Quito, Ecuador, which is at a very high altitude—somewhat over 10,000 feet. The Yagi-Uda design, because of these high voltages, had a bad habit of developing corona discharge from the element ends. These corona arcs caused the antenna to burn up and destroy itself. Moore tried several methods to reduce the voltage coupling from the element ends. He even tried using copper toilet flush bowl floats on the elements. However, nothing worked. The antennas still burned up.

Moore rationalized, and very correctly I might add, that an antenna with "Low Q" elements wouldn't have this problem. He therefore constructed a Yagi beam using full wavelength elements consisting of closed full-wave loops. Moore immediately solved the corona problem using a single loop. He then considered adding elements for a more directional antenna, which he did. He found that in his measurements, by simply using a driven element (full wave in size) and a single reflector (full wave), he could very closely approach the 7 dB gain of the three-element, half-wave element length Yagi.

Moore found several features in this new antenna which made it a worthy competitor of a Yagi. At that altitude rain and snow striking a Yagi in many instances created very heavy static simply because of the electrical charge in snow or rain. It is worth mentioning here that there were several quads used by the military in the recent Desert Storm operation. Sand storms, with their charged sand particles, made the use of Yagis practically impossible, while with the quads the noise was not present. In addition, the basic two-element quad is usually much lighter in weight to rotate.

Moore, however, had a very difficult time convincing the antenna engineering society that he had made a worthwhile



This is a really good-size log periodic that Jim Smith, VK9NS, just built. The antenna is designed to cover 20 through 10 meters. The shortest element is 13.5 feet, while the longest is 30+ feet. This antenna ranges in gain from 5 through 8 dBd.

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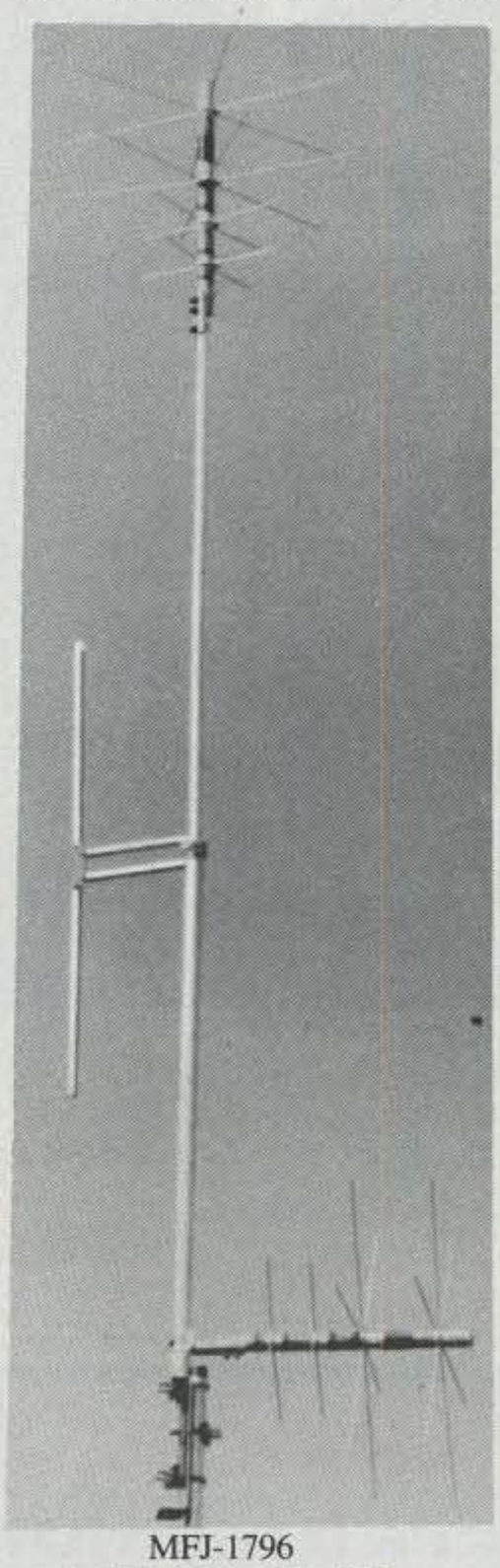

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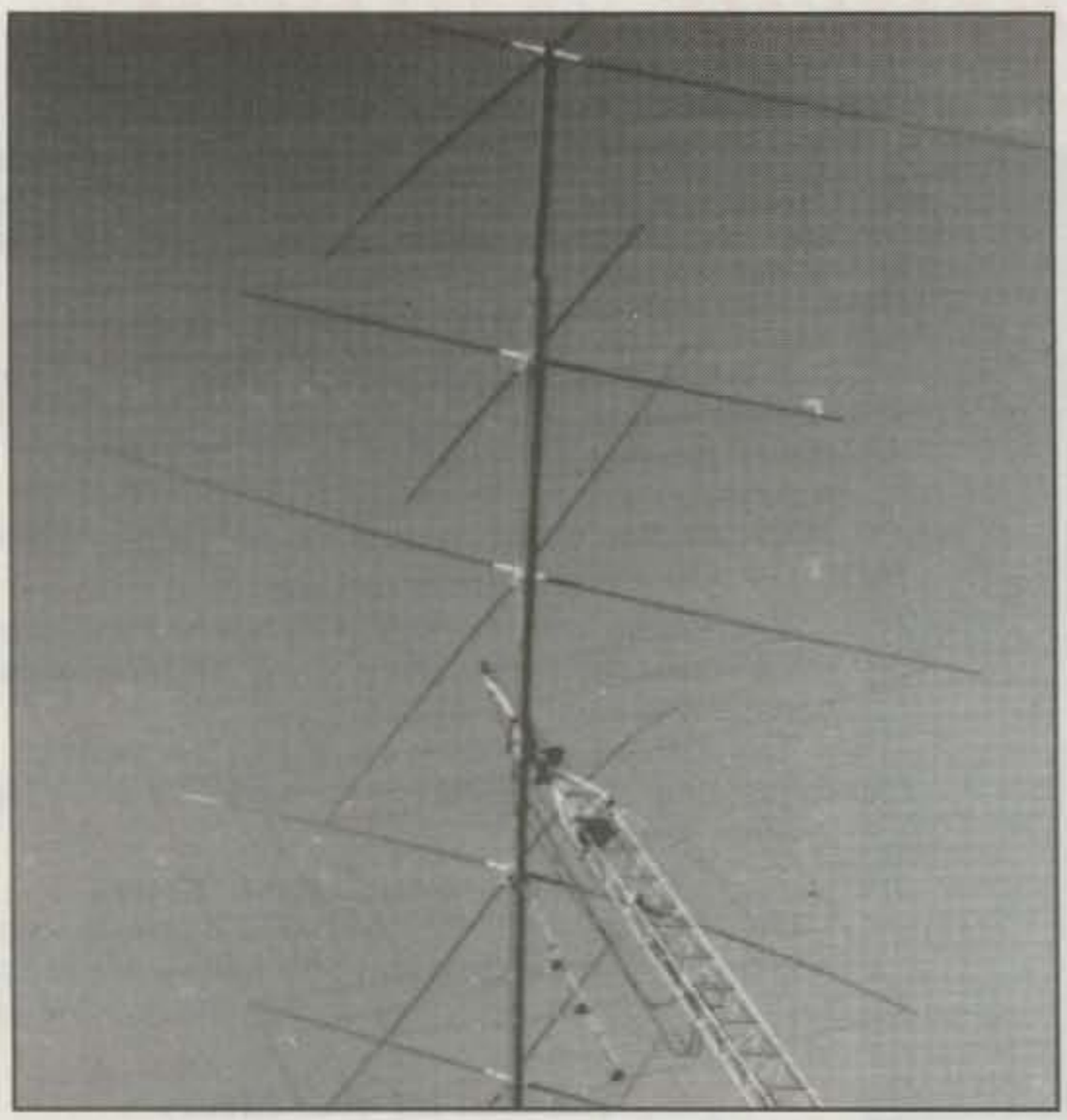
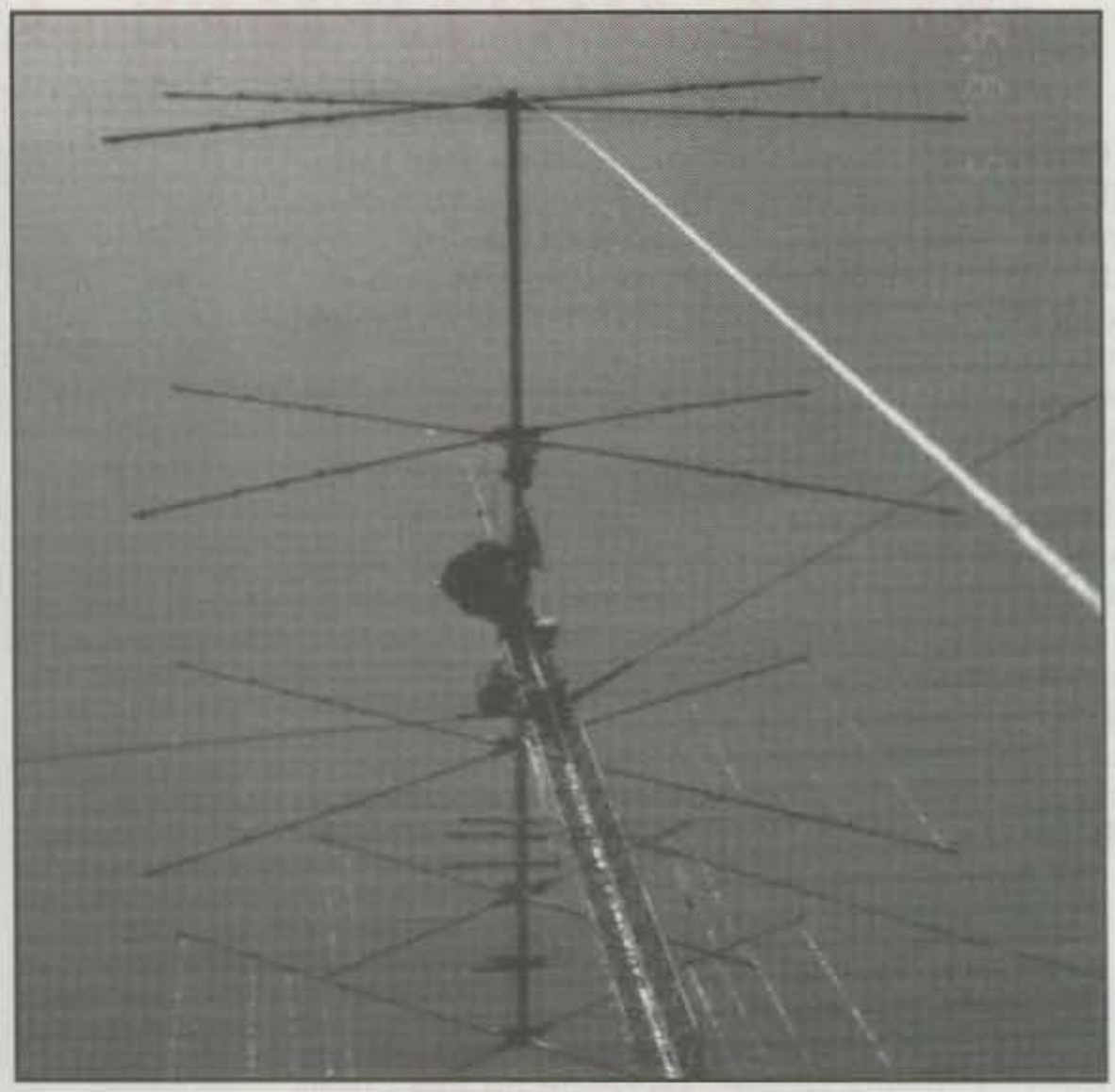


This is a very large multiband quad that Arch Doty had up some years ago. He said it was a world beater, but he could not find a rotator that would stay together. Too much wind-loading.



This is a commmercial multiband, multi-element quad made by Antenna Mart. CQ has never reviewed one of these antennas. I've seen it at Dayton and other conventions, and it looks like a real performer.

contribution to the art. I have always felt sorry that Moore never really received the recognition he so richly deserved. But the quad did become very popular with foreign stations, simply because the construction materials were easy to obtain, and the antenna was cheap to make.

As an aside, I knew Moore personally. While we were not exactly next-door neighbors, he only lived about 100 miles from me when I was W9FHZ living in Illinois and he was living in Indiana, back in 1947. At that time a large group of DX-ers hung out at 28.500 MHz on 10 meters chasing DX, and Moore, when he was home from Ecuador, was one of them. Obviously, there was a lot of competition and serious discussion of quads versus Yagis long before the quad really became popular. Also, to be honest, I was of the "wide-spaced" Yagi school because several of us had discovered that wide-spaced element Yagis performed better than close-spaced jobs. I will also admit that many of us did not know a lot about antennas then. This was really the beginning of the directional beam era. However, in all honesty, Clarence Moore with his two-element quad could take DX away from many of us at times when we were using four-element beams. I also might add for those who question, we were all running the legal limit, which was one kilowatt input to the final amplifier in those days.

It was only a few years later that I went

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R2 Rotator	8 conductor (2x16, 6x18)	37¢
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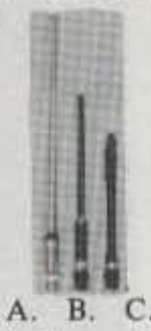

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to work for the ARRL in the Technical Department. I found that although the department had checked out a single quad loop and found that the loop had nearly double the decibel gain of a dipole, there was no enthusiasm for a quad.

As to actual gain, a single full-wave loop showed 1.8 dB gain over the half-wave dipole. I will admit it was a cumbersome antenna to build, and in those days it was not really strong structurally.

While this has nothing to do with a technical article on quads and Yagis, I cannot help but mention it. When I moved to Connecticut and went to work at the ARRL, the salary was nothing to brag about. I was married with two daughters, and so like many, I didn't have much money for towers, antennas, and so on. At that time I discovered that Persian rugs were shipped from the Middle East wrapped around long bamboo canes. It so happened that there was a rug store just across from ARRL headquarters. I made friends with the store owners and soon had a supply of canes, which made excellent supports for the wires of quads. And believe me, I made quads! (Plus scores of other weird antennas!) I honestly believe that at the time I probably garnered more experience with quads than most amateurs. However, while all this is related, I am getting away from the real aspects of this article.

I have long argued that for a given boom height a quad has a "slightly" lower angle of radiation than a Yagi. There is a current stacking effect in a quad element so that you really have two halfwave elements with the current points at the bottom and top. Such stacking, while not great, does produce more power at a slightly lower angle. I know there have been tests made (over short periods) that argue I am mistaken. However, knowledgeable DXers and most old timers will tell you that because of a slightly lower angle of radiation, the quad will "open" a band to DX earlier and keep the band open slightly longer than a Yagi at the same boom height. I agree with these people, and I have a very good reason for doing so.

For a number of years, while employed at the ARRL I was also engaged in a "monitoring" program of several foreign broadcast stations. I was using a two-element quad at a boom height of 50 feet. At the same time, another amateur who also worked at the ARRL was engaged in the same program, monitoring the same stations, and he was using a Yagi at exactly the same boom height—50 feet. Without exception, I could hear the stations earlier and later than the other amateur could. This was not a test that was conducted over a week or over a month, but over a two-year period consisting of well over several thousand stations being monitored! I'll be the first to admit that this was empirical testing, but it sure was one very long and conclusive empirical test.

I therefore stick by my guns on point one: For the same boom height, the quad does have a lower angle of radiation than a Yagi. In my mind, this is a point in favor of the quad. However, I must be very honest here and state that as to actual gain, there wasn't that much difference in received signal strengths between my quad (multiband) and the three-element Yagi. However, note that I said my quad was a three-bander—20, 15, and 10.

Again, I want to be fair and not leave the wrong impression. Those quads with bamboo spreaders really did not care for Connecticut ice storms. Not that the Yagis particularly liked ice either, but they did stand up better to the weather. Because of this early quads got a bad reputation. Keep in mind, however, that this was over 40 years ago, and construction techniques have vastly improved since then. I can see no real difference in structural strength between quads and Yagis using modern materials. So if I have to judge Yagis versus quads from a structural standpoint, I think the time has come to forget about the old bamboo quad days. The modern spiral-wrap plexiglass support rods certainly equate to aluminum tubing in strength. On that basis, then, let's call them even. In fact, I know of several quads that weathered the 1992 hurricanes while Yagis did not.

I haven't yet touched on Delta Loop beams, which consist of full-wavelength elements, the same as a quad. This antenna was designed by Harry Habig, K8ANV. In the beam configuration the triangle (see fig. 3) is fed at the bottom. There are two main radiation points—the bottom where the antenna is fed, and at the center of the top of the triangle. The two sides of the triangle are customarily mounted on the boom with a wire connecting the top. One of the advantages of this method is that for a given boom height, additonal height is also achieved while providing a lower radiation angle. One of the disadvantages of the Delta Loop is that when multibanding, completely seperated antennas are required, making a physically "tough" job of boom mounting. Gains of a two-element quad are very similar to those of a two-element Delta.

I hope I have whetted your appetites up to this point. In Part II, I will try to get into the real meat of the subject of comparisons. We will discuss multibanding and what the best all-around multiband antenna is (in my opinion!). Also, I will covert log periodics and the Sommer-type beam.

(To Be Continued)

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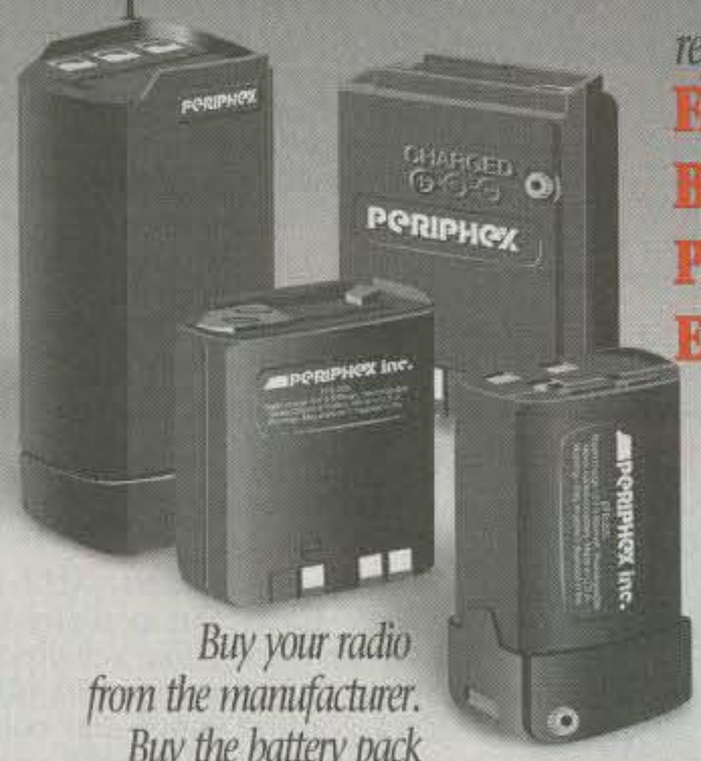

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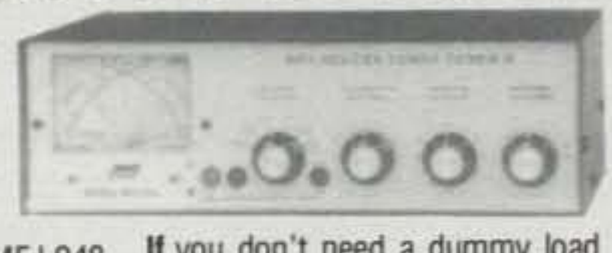

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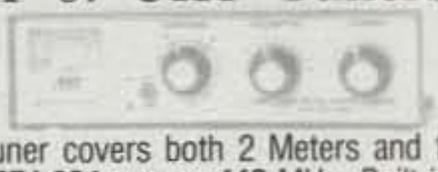

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CIRCLE 5 ON READER SERVICE CARD

CQ REVIEWS:

The SincLabs SBP144-4 Cavity Filter

BY ED JUGE*, W5TOO

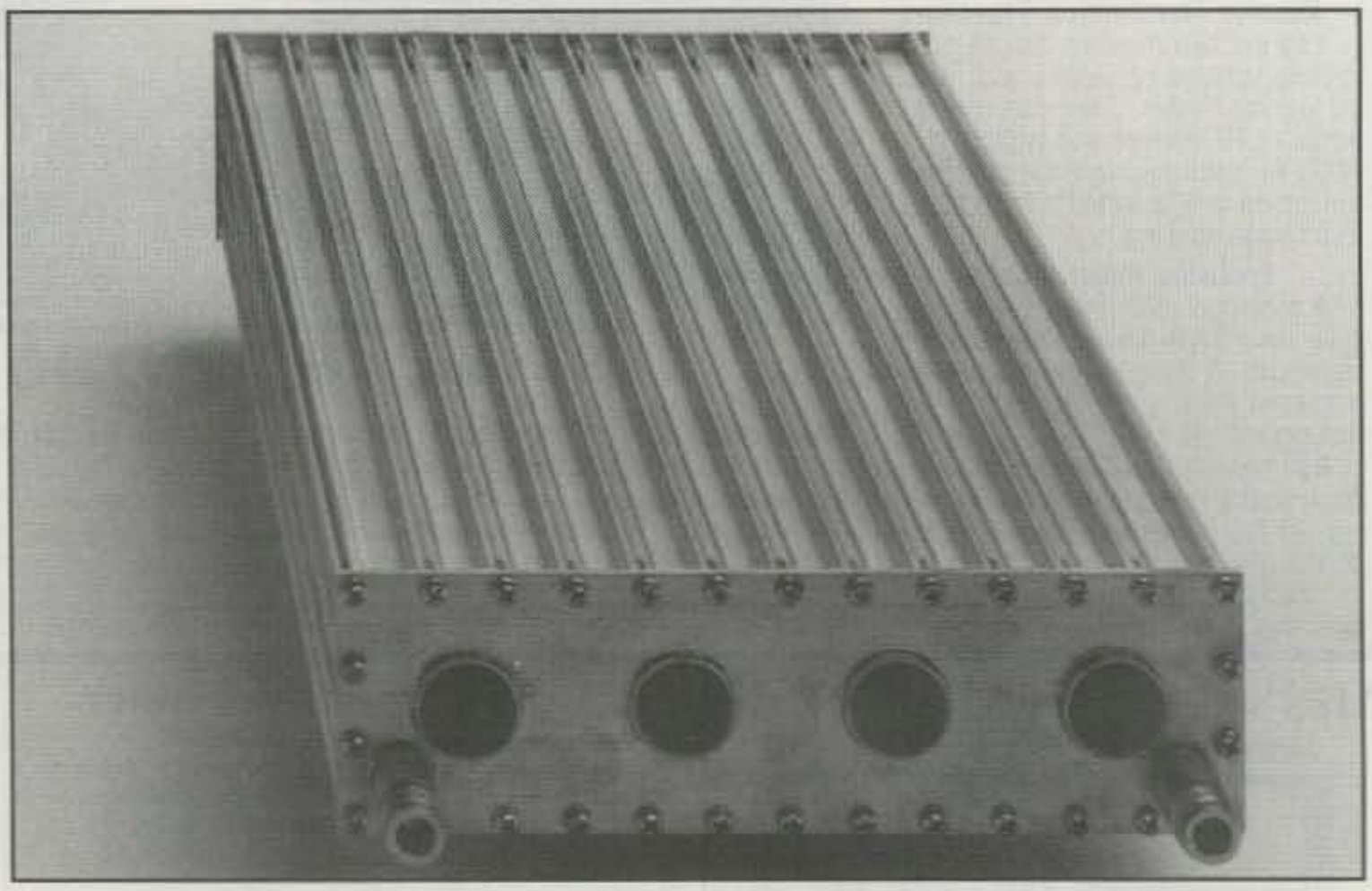
Two meter FM was fun once, but in Fort Worth, Texas, and in many inner city areas, interference from a maze of commercial transmitters and paging services has made operation unpleasant to impossible. But at least for Fort Worth, I have found a cure.

Five years ago my commute time was great for keeping up with local amateur friends on 2 meters. Many of us successfully used simplex mobile to mobile. Then over a period of months the intermod began to take over. We moved to a local repeater, and the problem was solved—temporarily. Within a year even the repeater was unintelligible about 50 percent of the time, making conversation impossible.

Seventy cm was usable, with only an occasional burst to contend with. However, if most of your friends aren't on 70 cm, you look for alternatives. Thus began my five-year quest for a solution. I traded for, or borrowed, nine radios (that I can remember). Some were absolutely useless. Even high-dollar rigs were eaten alive in places I didn't know intermod existed. One interesting model sounded promising until I realized that it simply squelched out the interference. In other words, when the squawking got bad enough, the radio simply clamped down harder so that nothing—not the repeater, not the interference—could get through. That almost sounded like a viable solution until I thought more about it. Since I couldn't hear the repeater, I could easily call on top of other users. I couldn't tell when or if someone else was talking, or even if the station I called was answering. That just wouldn't do at all.

My experience with each new radio followed a similar pattern. I'd find a good performer that was 95 percent immune to the problem and use it happily for six months or so until the creeping intensity of the intermod caught up. Within a year at the most my good performer lost the battle, and I was looking once again.

One or two big-name radios locked up solid with intermod when I was still three miles from downtown! These weren't low-end transceivers either; both were $700 (street price) dual-band units!



The SincLabs SBP-144-4 four-cavity filter. It's small enough to go anywhere you want to operate.

Recent trends in amateur VHF/UHF radios have compounded the problem. To remain competitive, manufacturers have answered customers' demands for receivers that cover from the aircraft band to those cellular phones that none of us listen to.

At one point during the struggle to work 2 meters I gave up on dual-band units and bought a great all-mode rig just for its tight front end. In the year I owned it, I attempted only one SSB contact. It also worked great for about 12 months, and then our problem won out again.

Some of my friends who are commercial-gear advocates claim to hear no intermod at all. On the other hand, an engineer at a local TV station told me the intermod virtually kills their commercial communications system, too. At any rate, I had no interest in going the used commercial gear route.

Late last year I bought a 2 meter unit that is highly touted for its rugged quality, commercial design, and the tightest front end on the amateur market. It was a joy to use. It performed as well as anything I had tried, but even it was wiped out 50 percent or more of the time for the last three miles of my drive to work. By the way, all this painful background detail is so you will know how bad the situation is in this area, and so you can appreciate the effectiveness of the cure.

The ideal solution, of course, would be external to and separate from the transceiver. That way radios could be chosen based on the desired feature set and changed at will. I looked for filters. A cavity would drastically restrict movement within the band. I talked to manufacturers, canvassed the hamfests, and picked the smartest amateur radio brains I could find. Zip! There didn't seem to be any other choices.

Then in April I was charging through the hallowed halls of Hara Arena during the huge Dayton Hamvention. It has been said, "If it's not at Dayton, it doesn't exist" (and never has).

Out of habit more than expectation I checked out any booth that looked like it might sell filters. I had not heard of SincLabs, Inc. of Aurora, Ontario, but they were displaying some pretty impressive products—mostly heavy-duty stuff such as antennas, duplexers, rack-mounted cavities, etc.—for repeaters and com-

*2000 Thousand Oaks Drive, Burleson, TX 76102

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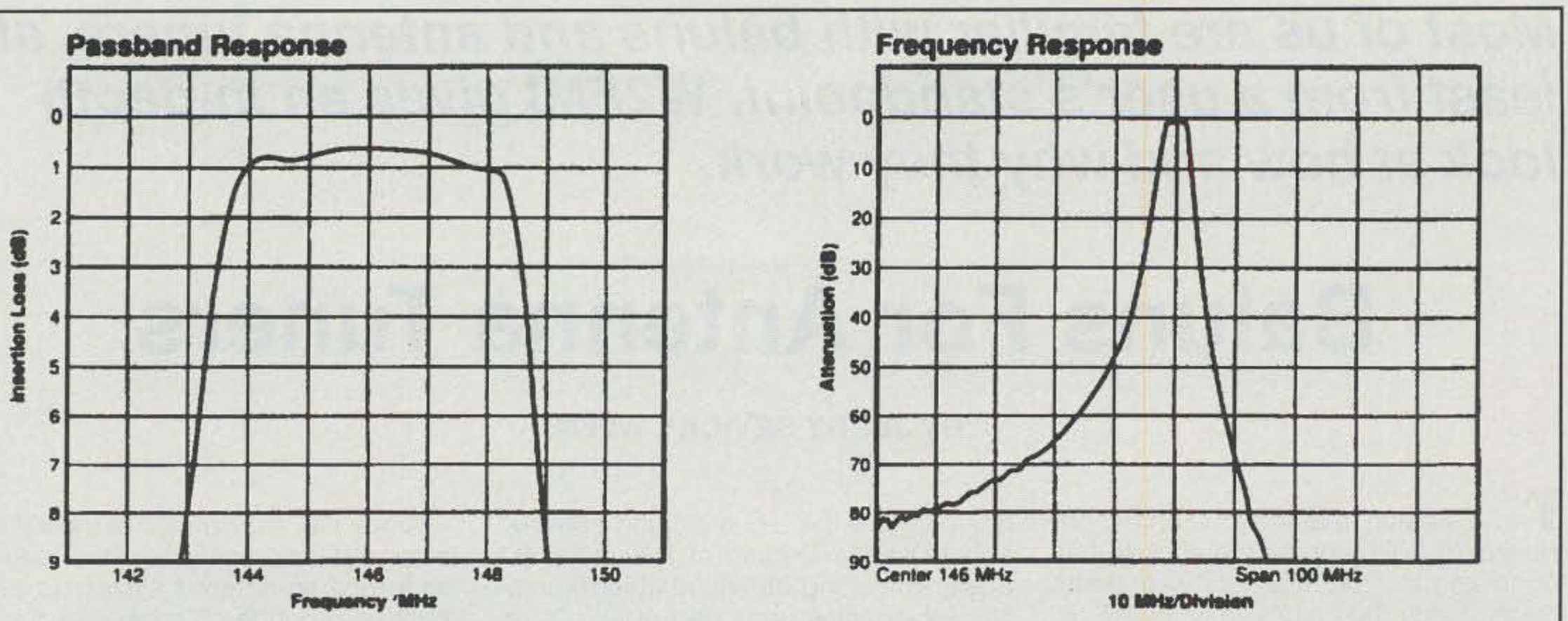

Fig. 1– Characteristic curves for the passband filter.

mercial applications. I commented to a representative at the booth that I certainly would like to find a 2 meter passband filter that would eliminate or substantially reduce intermod. "We have a 2 meter passband filter," she remarked, "but you really need to talk to our engineer about it, and he's at lunch."

I didn't wander far from this booth! Was this the answer to my prayer? Glancing over their rack-mounted cavities, I could picture something four feet long and two feet wide. I began to visualize how bad it would look behind the rear seat in my Chevy Suburban, but at least it would fit.

It wasn't too long before engineer Bob Morton returned. I impatiently waited for him to finish with two other folks who had gotten to him before I did.

They had brought only one SBP144-4 filter to Dayton. I was surprised and delighted to find the dimensions were only 11" × 8½" × 2½" and it weighed 7.06 pounds! Bob was confident it would cure my intermod. However, he did caution that it is a little expensive for individual use. Expensive is in the eye of the beholder, and this beholder's eye was already a bit distorted from five years of trading for new radios and five years of being able to only marginally enjoy my hobby.

The SBP144-4 is a very rugged, silver-plated, compact, 2 meter, 4-cavity, re-entrant, band-pass filter that provides full band coverage. Its design combines maximum out-of-band attenuation with minimum in-band insertion loss. The cavities are aperture coupled to eliminate inter-cavity loss. Best of all, no tuning is required, and you can pass 150 watts of transmit power through it.

According to the specification sheet, the operating frequency is 144–148 MHz. Maximum insertion loss is 1.0 dB and maximum VSWR is 1.5:1. The filter has steep skirt, dropping almost 10 dB, just 1 MHz outside either edge of the band. On the high-frequency side, where the problems live, it is more than 65 dB down at 156 MHz.

The suggested retail price was $395. Apparently, SincLabs has made little effort to advertise or publicize the product. Bob said if they find a demand for the product, the price will come down with volume.

The filter works better than I had dared hope. I set my squelch "on the ragged edge" when I leave home and at worst get a couple of 2 second squelch openings in the worst downtown areas. Even then, no intermod is noticeable. If I open the squelch, I can sometimes detect the telltale squawking, almost lost, deep in the noise. A signal that doesn't even register on the S-meter is 100 percent copy.

Fort Worth is home to a NOAA weather station on 162.55 MHz. With the filter in line, it is only copyable within about a few miles of the transmitting tower.

No, $395 isn't cheap, but this was one of my more practical amateur radio purchases. It adds much more to the enjoyment of 2 meter mobile operation than any amplifier or other gadget. And now I can change radios at will, having to be concerned only with the features I want. It's a one-time purchase.

Goodbye, 2 meter intermod! Good riddance. Thank you, SincLabs.

If you are interested in contacting SincLabs, they are at 85 Mary Street, Aurora, Ontario L4G 3G9 Canada (phone 416-841-0624; FAX 416-841-6255).

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CQ

CIRCLE 13 ON READER SERVICE CARD

Most of us are familiar with baluns and antenna tuners, at least from a user's standpoint. W2FMI gives an in-depth look at how and why they work.

Baluns For Antenna Tuners

BY JERRY SEVICK*, W2FMI

The 4:1 balun, matching 50 ohms (unbalanced) to 200 ohms (balanced), has found its most popular use in antenna tuners. Since the balun rarely sees a resistive load of 200 ohms in this application, the primary objective is to take the balanced impedance (with respect to ground) of the input to an open-wire (or twin-lead) feedline and transform it into an unbalanced impedance which has one side grounded and can be transformed into 50 ohms by an L-C matching network. This was well described in two recent *CQ* articles by Lew McCoy.[1,2]

As many are aware, there are two different forms of the 4:1 balun. One uses two transmission lines wound on separate cores (or threaded through ferrite beads in some cases) and connected in parallel at the 50 ohm side and in series at the 200 ohm side. This design was first presented by Guanella in 1944[3] and is presently called a *current* balun.[4] The other design, using a single transmission line wound around a core and connected in a phase-inverter configuration was introduced by Ruthroff in 1959.[5] This design, which has recently been called a *voltage* balun,[4] is now perceived as the inferior design.

This article presents a new view of the 4:1 balun. It not only includes the optimum design considerations for antenna tuner use, but also the design parameters for multiband antenna systems using center-fed dipoles and open-wire feedlines. Also included will be my views on the G5RV antenna, the tuner using a 1:1 balun before the L-C matching network, and the special case of Ruthroff's 4:1 design matching into a load which is actually (or virtually) grounded at its center. The analysis and experimental results on this special case of the Ruthroff 4:1 balun are probably presented here for the first time.

*32 Granville Way, Basking Ridge, NJ 07920

Antenna Tuners

Three of the more common items in current amateur radio jargon are VSWR, antenna tuners, and multiband antennas (especially the G5RV). These have appeared upon the scene because of the ease with which bands can now be changed and the narrow limits in the range of matching impedances with modern rigs.

The concept of using a wire antenna on many different bands is not new. Designs have been around for more than five decades. In fact, also available have been satisfactory circuits which couple transmitters to balanced lines that present loads different from the transmitter output impedance. These were known as series- and parallel-tuned circuits.[6] The transforming of a balanced impedance to an unbalanced impedance was done by the isolation provided by magnetic coupling. Energy was transmitted from one circuit to the other either by having two coils in close proximity or by "link" coupling. These methods of coupling, however, have gone by the wayside together with rock-bound rigs, plug-in coils, separate receivers and transmitters, and (sad to say) the exciting flashing of mercury-vapor rectifiers.

Today the *Transmatch* is mostly used to convert the reactive/resistive load presented by an antenna system to a non-reactive, grounded 50 ohm load. It is also commonly known as an antenna tuner. The isolation role, that of converting a balanced impedance to an unbalanced one, is now provided for by the balun transformer.

There are two basic forms of the Transmatch and they are shown in fig. 1. Fig. 1(A), which shows a 4:1 balun between the L-C network and the balanced transmission line, has been (by far) the most popular. This form places the burden on the balun and not on the L-C network. Depending upon the dimensions of the antenna and open-wire (or twin-lead) transmission lines, the balun can see very high impedances that can be harmful. In turn, the L-C networks are simple because of their unbalanced nature. Among the most popular networks are L, pi, T, Ultimate, and SPC types.[7–10] Furthermore, an added advantage to this approach is that the balun can be placed outside the operating area and be connected to the L-C network by a coaxial cable.[1,2]

On the other hand, fig. 1(B) takes the complexity out of the balun and places it on the L-C network. With a balanced network, the 1:1 balun should see a lower voltage drop along the length of its transmission line (and hence less loss[11]) since its load is always close to 50 ohms. Additionally, the choking requirements of a 1:1 balun (using transmission lines coiled about a core or threaded through ferrite beads) are considerably less then that of the 4:1 balun in fig. 1(A).

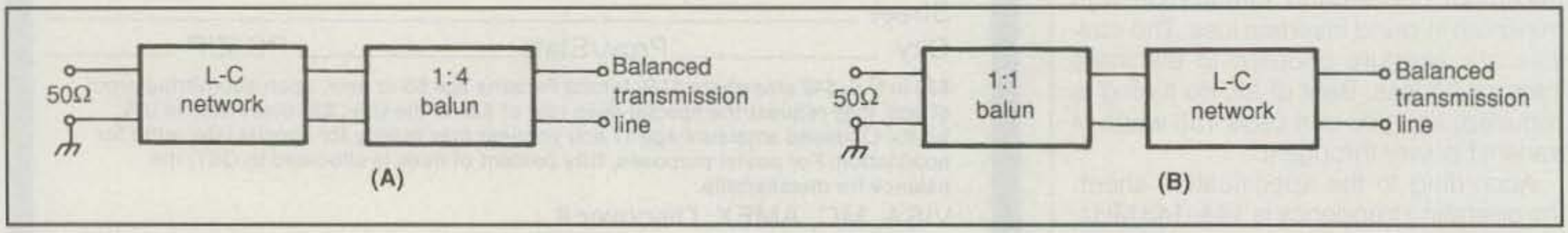

Fig. 1– The two basic forms of the Transmatch (antenna tuner): (A) the more popular one using an unbalanced L-C network and a 1:4 balun; (B) a 1:1 balun and a balanced L-C network.

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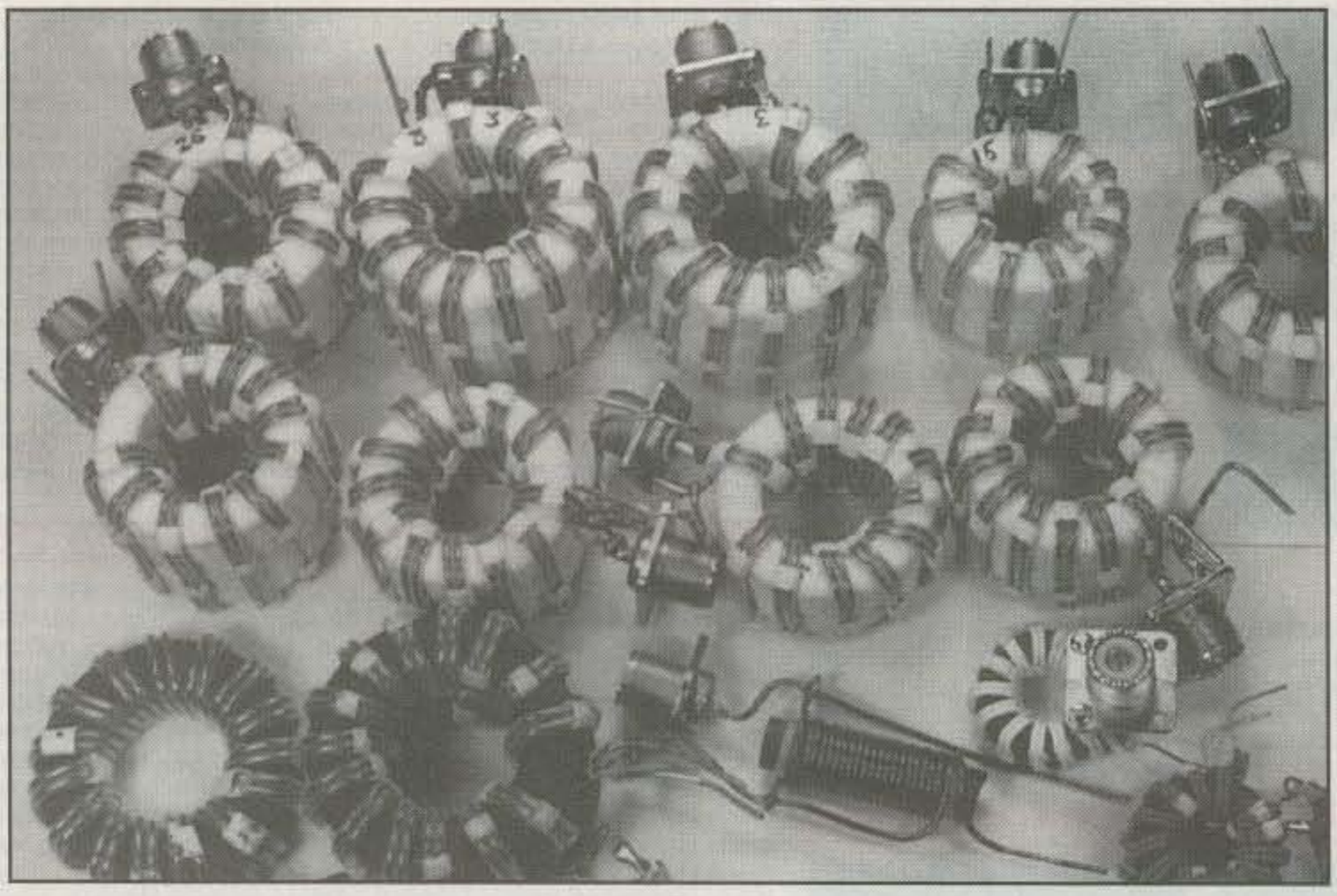


Photo A– The various baluns used in the study of 4:1 baluns for antenna tuners.

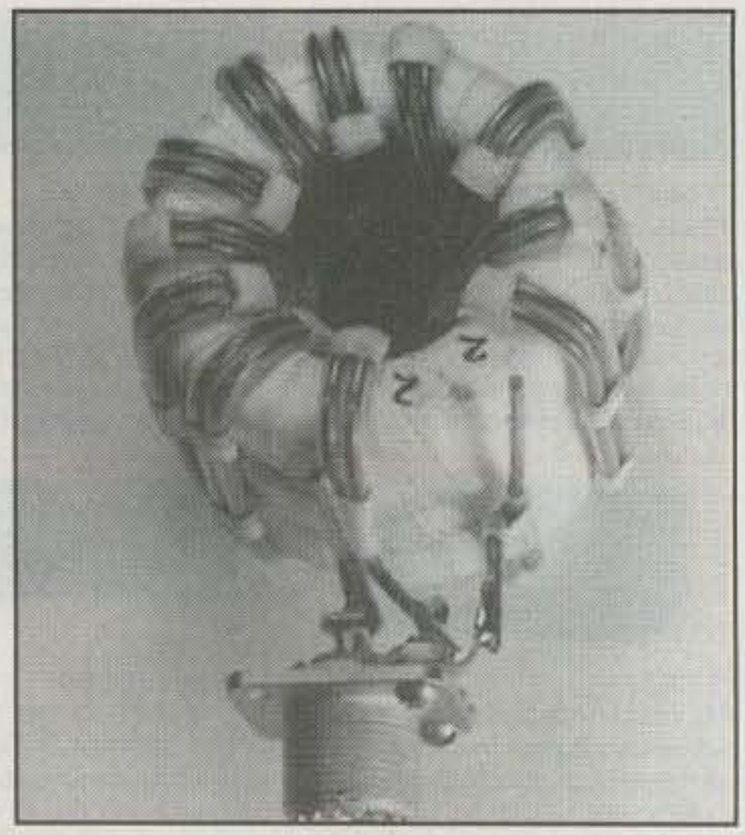


Photo B– The high-power Ruthroff 4:1 balun used in the comparison with three other baluns (see fig. 5). Except for some difference in the characteristic impedance of the bifilar winding, it is essentially the McCoy 4:1 balun.

Roehm has addressed the problems related to this form of Transmatch in a recent article.[12] In fact, he suggests a design using an unbalanced T network and a 1:1 beaded-coax balun. Although a balanced L-C network is inherently more complex and costly, it would be interesting to see its comparison with Roehm's unbalanced design. Additionally, a comparison with a 1:1 balun using 50 ohm twin-lead wound around a ferrite toroid with a permeability of less than 300 would also be useful. Since the 1:1 beaded-coax (choke-type) balun requires ferrite beads with permeabilities much greater than 300, it is has more loss.[11]

In any event, the basic form of the Transmatch using fig. 1(B) looks promising and merits further investigation.

The 4:1 Balun

This section presents my views and results on a 4:1 balun designed for use in the very popular "antenna tuner" shown in fig. 1(A). Since the balun can be exposed to harmful high-voltage conditions in this application, important considerations are the efficiency and ruggedness of the core materials. Experiments have shown that losses in baluns are related to the impedance level[13] (and hence voltage level) and the permeability of the materials. Therefore, the losses are of a dielectric-type and not of a current-type as in conventional transformers. Moreover, it is well known that powdered-iron is a more rugged and linear material than ferrite. In addition (and a very important consideration), which form of the 4:1 balun should be used in this application—Guanella's or Ruthroff's? My conclusion may surprise many readers.

As was mentioned at the beginning of this article and above, there are two basic forms of the 4:1 balun. They are shown in fig. 2. Fig. 2(A) is Guanella's approach, which uses two coiled transmission lines (on separate cores) connected in parallel on the 50 ohm side and in series on the 200 ohm side. This has recently been called a current balun.[4] In order to have "flat" transmission lines and thus obtain the highest frequency response, the characteristic impedance of the coiled transmission lines should be equal to the loads they see—namely, $1/2R_L$ and in this case, 100 ohms.

As Guanella said in his classic paper,[3] this balun is literally *frequency-independent.* Also, at the low frequency end, the reactance of the coiled transmission line should be much greater than 100 ohms (in this case) in order to assure that the energy is transmitted from input to output by an efficient transmission line mode. Additionally, beaded transmission lines are not recommended for use in the HF band and at these impedance levels be-

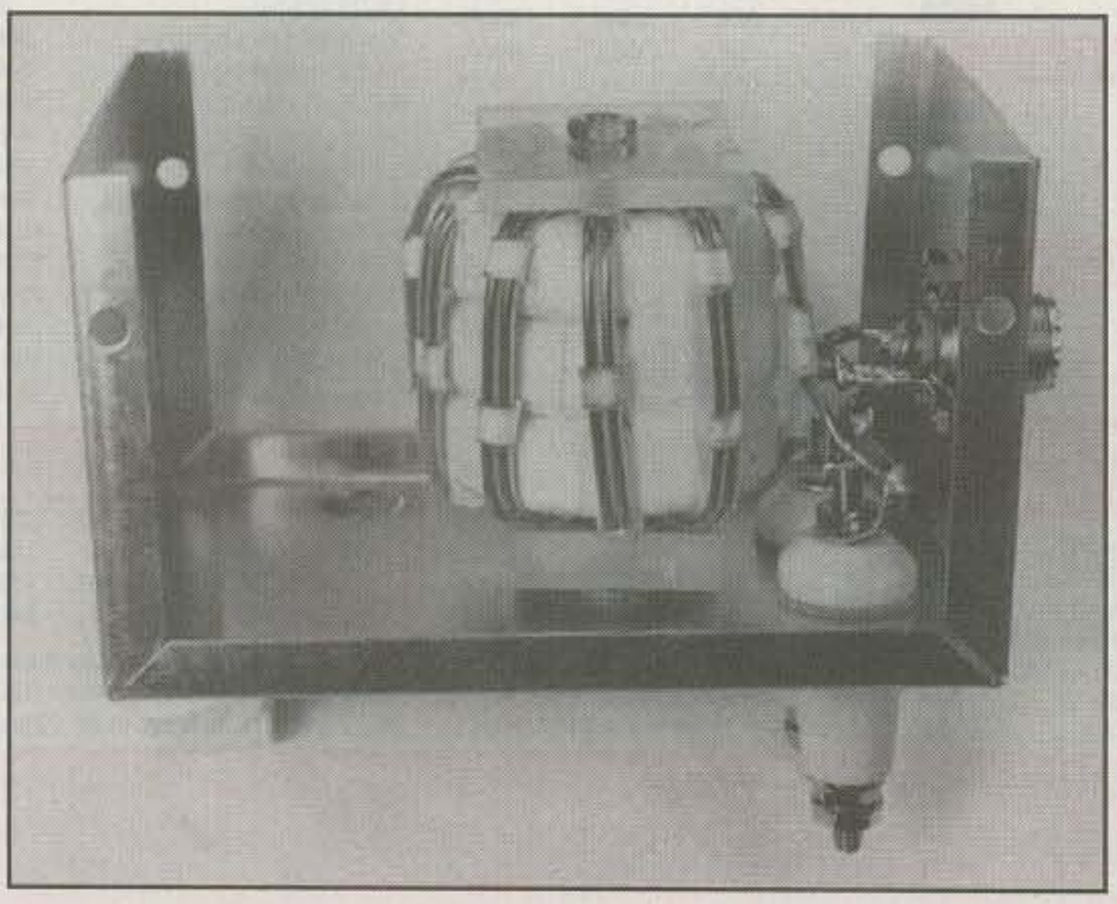
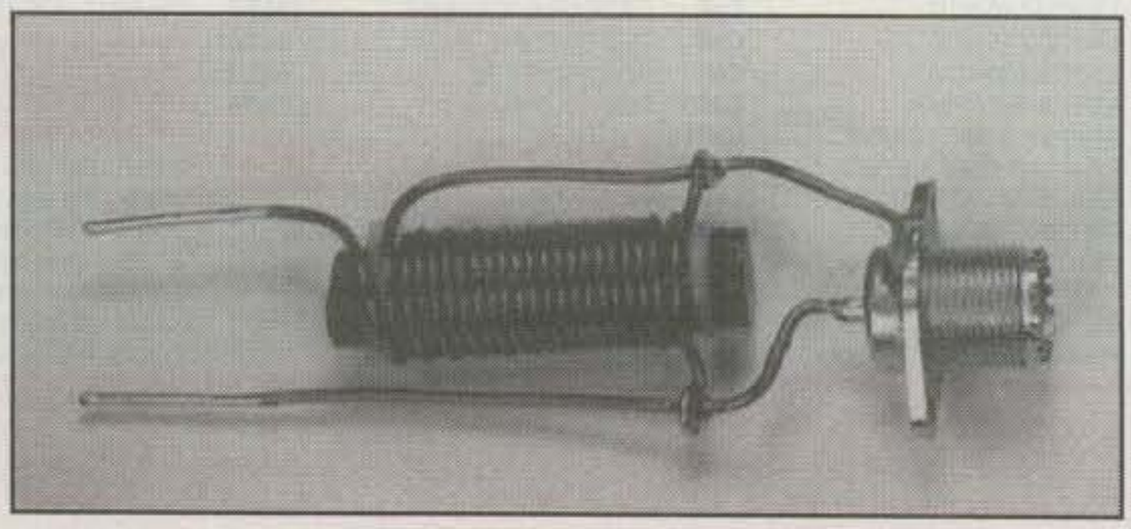


Photo C– The balun of photo B mounted in a 5"L × 4"W × 3"H minibox.

Photo D– The 4:1 Hi-Q balun which uses the Ruthroff design on a tightly-wound ferrite rod.



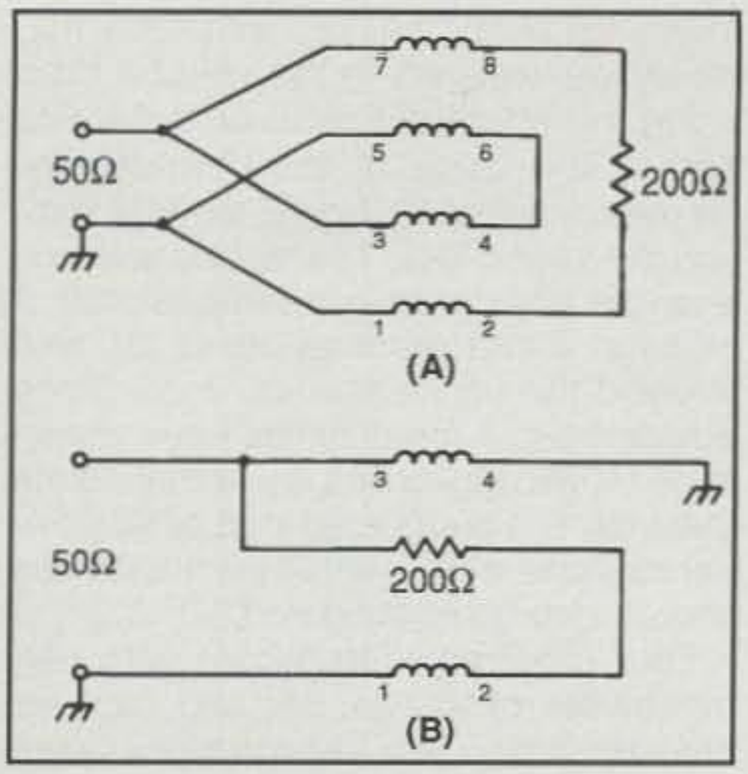


Fig. 2– The two basic forms of the 1:4 balun: (A) the Guanella (current) balun and (B) the Ruthroff (voltage) balun.

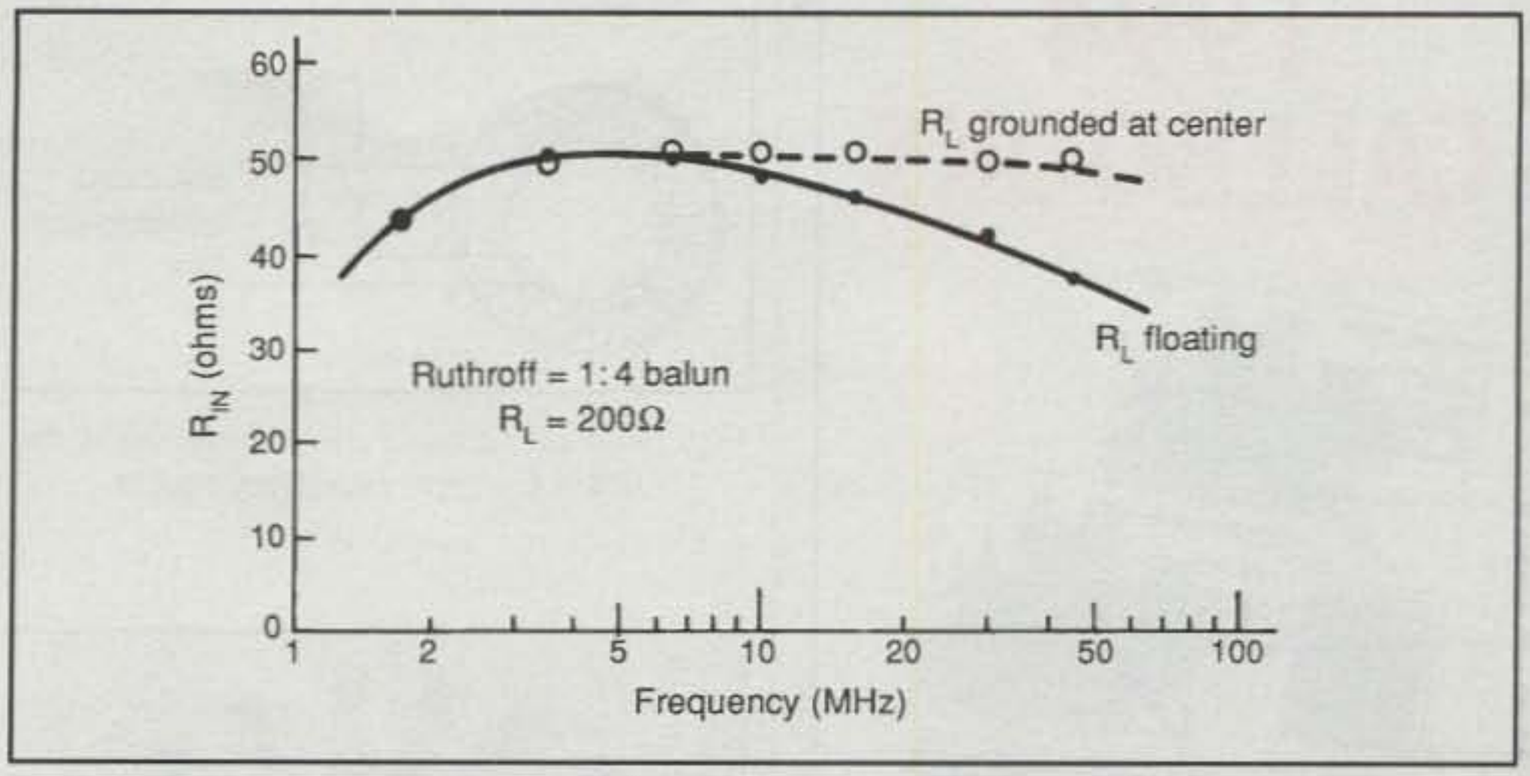


Fig. 3– The frequency response of a 4:1 Ruthroff (voltage) balun with the load floating and with its center grounded. In the grounded case the balun becomes a 4:1 Guanella (current) balun.

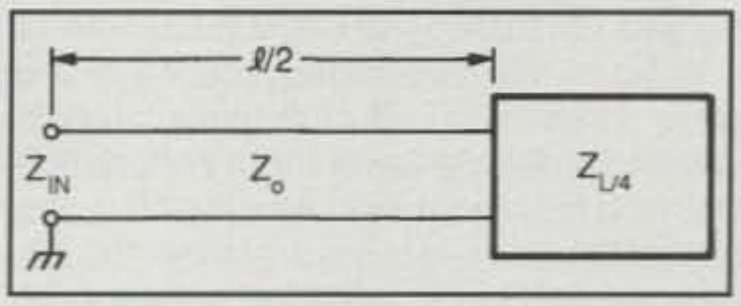


Fig. 4– Suggested model of the Ruthroff (voltage) balun when the load, Z_L, is grounded at its center. Z_o is one-half of the characteristic impedance of the bifilar winding and L is the actual length of the winding.

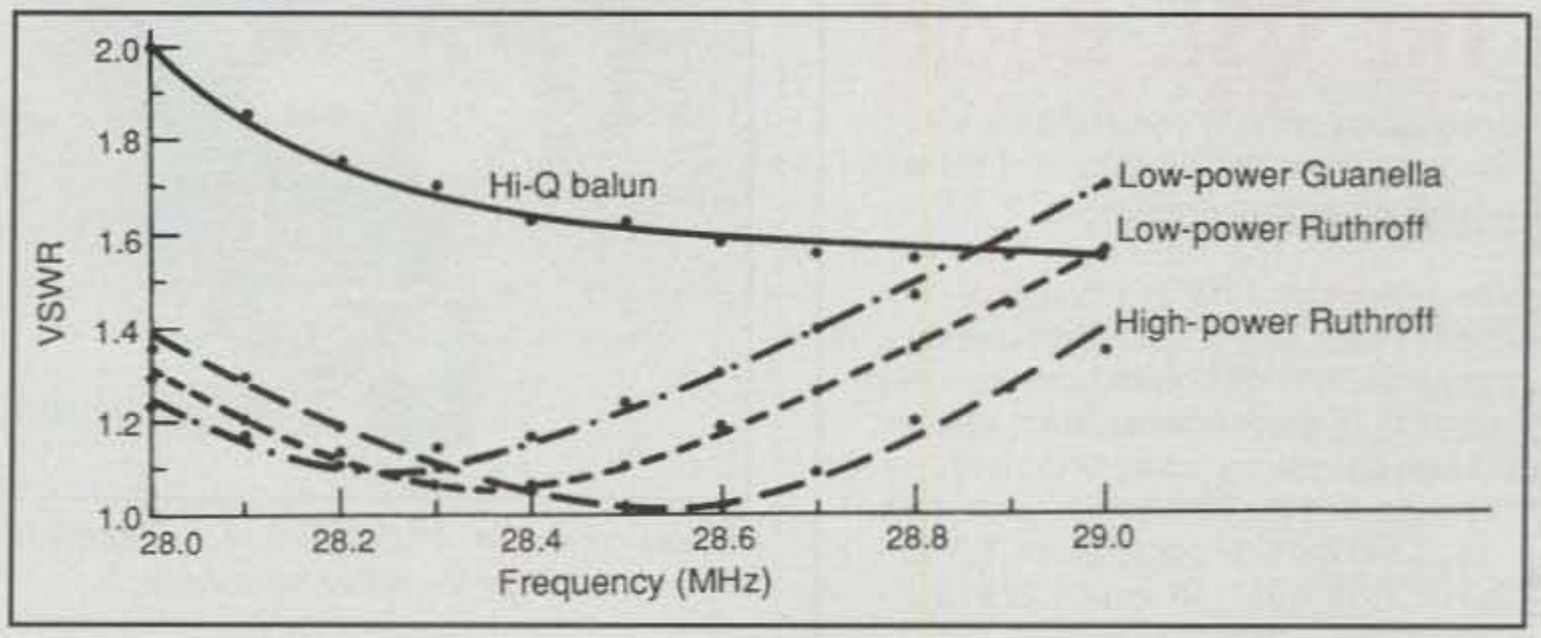


Fig. 5– Plots of VSWR curves on 10 meters for four different 4:1 baluns. The high-power Ruthroff balun is actually McCoy's design. The Hi-Q balun is a Ruthroff design using tightly-wound, single-coated wire on a ferrite rod.

cause of excessive dielectric loss.

Fig. 2(B) shows Ruthroff's approach, which uses a single transmission line connected in the phase-inverter configuration.[11] By grounding terminal 4, a voltage drop of $-V^1$ appears across the length of the transmission line. Thus, terminal 3 is at $+V^1$ and terminal 2 is at $-V^1$—a 4:1 transformation ratio. But a *very* interesting feature with this approach is what happens when the load is actually (or virtually) grounded at its center. A simple impedance measurement will show that the high-frequency response is *vastly* improved and that the Ruthroff (voltage) balun takes on the character of a Guanella (current) balun! Fig. 3 shows the measurements of the input impedance of a Ruthroff 4:1 balun with the load floating and when it is grounded at its center. These measurements (with a simple resistive bridge) were on my design using a powdered-iron core, which will be described later. This could well be the first published data on the behavior of a Ruthroff balun when the load is grounded at its center.

A suggested model for the Ruthroff 4:1 balun, when the load is grounded at its center, is shown in fig. 4. If the characteristic impedance of the transmission line in the 4:1 balun is 100 ohms (the optimum value if the load is 200 ohms), then the characteristic impedance in the model of fig. 4 is 50 ohms. Since the balun usually sees higher impedances than 200 ohms in actual use, the optimum value of the characteristic impedance of the bifilar winding could be less than 100 ohms. This would present a smaller input impedance to the balun at the higher frequencies.

Furthermore, since the high-frequency response is so vastly improved over the floating load case, the effective length of the transmission line could be one-half of its actual length. This can be seen in fig. 2(B), where the effect of ground is at the center of the transmission line. And finally, another point (which is misunderstood by many) is that if the reactance of the coiled or beaded transmission line is much greater than $Z_L/2$ (where Z_L is complex), then the balun would handle a complex load the same way as a short length of transmission line does. Properly designed baluns *can* handle loads with a reactive component.

In order to confirm the model with a virtual ground, a series of VSWR measurements were made on 20, 15, and 10 meters with folded dipoles at heights of 0.17 wavelengths above ground. This height was found to yield a resonant impedance of 200 ohms when using 300 ohm TV ribbon. Photo A shows the various baluns used in this experiment as well as in the investigation of different powdered-iron cores. Fig. 5 shows the results on 10 meters with four different 4:1 baluns. The high-power Ruthroff balun is actually McCoy's design, which uses 11 bifilar turns of No. 14 H Thermaleze wire on three T200-2 cores. The wires are also covered with 15-mil wall Teflon® tubing yielding a characteristic impedance close to the optimum value of 100 ohms. I differ with McCoy's design here, since the characteristic impedance of his balun could be closer to 50 ohms. Photo B shows the balun unmounted and Photo C shows the balun mounted in a 5"L × 4"W × 3"H minibox. The low-power units shown in fig. 5 used 14 bifilar turns of No. 18 hook-up wire on 1.25 inch OD ferrite

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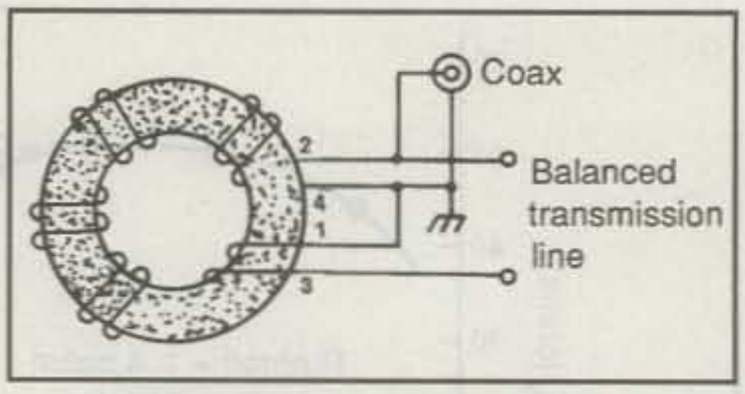

Fig. 6– A pictorial of the connections for a 4:1 Ruthroff (voltage) balun.

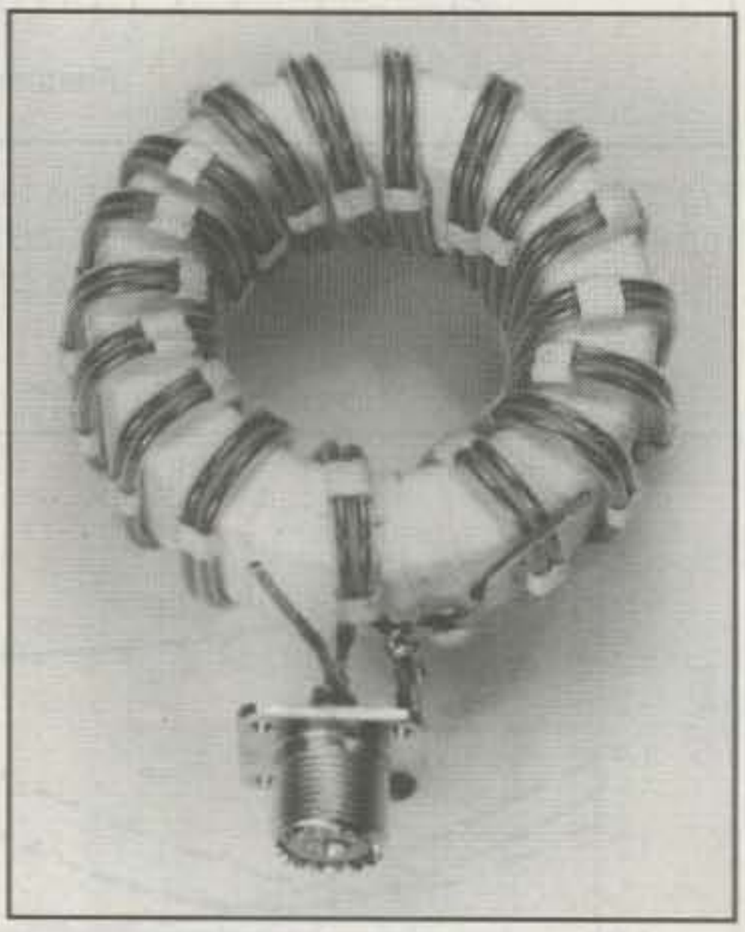

Photo E– An improved 4:1 Ruthroff design for antenna tuners.

toroids with a permeability of 250. The transmission line of the high-power unit was 50 inches in length, while those of the low-power units were just under 20 inches. Photo D shows the Hi-Q balun used in the comparison.

As can be seen in fig. 5, there is only a small difference between the VSWR curves of the two low-power baluns and the high-power Ruthroff balun. The differences could very well be attributed to the small differences in the characteristic impedances of the bifilar windings. It should also be pointed out that the differences became less as the wavelength was increased. In fact, on 20 meters the VSWR values for all four baluns practically fell on the same curve! The Hi-Q balun was shown here because it illustrates what happens when the characteristic impedance is far from the optimum value (less than 50 ohms when it should be 100 ohms). Photo D shows the 4:1 Hi-Q balun.

A final study was made to determine the best core material for a 4:1 balun to be used in antenna tuners where they can be exposed to high impedances (and hence, hostile environments). It was known from very accurate insertion loss measurements[13] that loss with ferrite materials was related to the voltage drop along the length of the transmission line and to the value of the permeability. Permeabilities of 40 (No. 67 ferrite) exhibited the lowest loss. The results taken on a single powdered-iron material, No. 2 material with a permeability of 10, also showed the very same low loss. Since powdered-iron material has been known to be more rugged and linear than ferrite material, this suggested that other powdered-irons with greater permeabilities should also be investigated.

Four other powdered-irons with permeabilities of 20, 25, 35, and 75 were investigated. Their designations were Nos. 1, 15, 3, and 26, respectively. Comparisons were made on input impedances (with the outputs terminated in 200 ohms) and temperature rises (when handling 500 watts of power). The power test showed, convincingly, that No. 26 material was not to be used because it showed a definite rise in temperature while the other three didn't. But all four materials showed a definite lower input impedance than the No. 2 material. As expected, the higher the permeability, the larger the difference with No. 2 material. Although an input impedance measurement does give some indication of loss because it appears as a shunting path to ground, a very accurate insertion loss measurement would give a more precise indication of the trade-off that can be made in efficiency for low frequency response.

Since my simple loss measurements indicated that the higher permeability powdered-irons had more loss than the No. 2 material, it was decided to design a 4:1 Ruthroff balun with this material but with a larger core and more turns than the McCoy[1,2] balun. Although McCoy's design has enjoyed considerable success over the years, a larger inductive reactance was felt desirable in order to assure better performance on the lower frequency bands (particularly 160 meters). A pictorial of its connections is shown in fig. 6.

The specific design* is shown in photo E. It has 17 bifilar turns of No. 14 H Thermaleze wire on a T300A-2 powdered- iron core which has an OD of 3 inches and a permeability of 10. With this number of turns and larger cross-section than the T200- 2 core, the low frequency response improved by a factor of about two over the McCoy balun which has 10 to 12 turns on a stack of three T200-2 cores. Furthermore, the wires are also covered with 15-mil wall Teflon tubing resulting in a characteristic impedance of 100 ohms (the objective). This well-insulated transmission line has been reported to handle 10,000 volts without breakdown. Fig. 3 shows the performance of this balun (under a matched condition)

when the load is floating and when it is center-tapped-to-ground. Photo F shows the balun mounted in a 5"L x 4"W x 3"H minibox. Photo G shows the top view of the mounted balun.

Fig. 7 shows a comparison of the McCoy 4:1 balun with one that has a larger core and more turns and one which has a permeability of 35. The differences at the high-frequency end are mainly due to the small variances in the characteristic impedances of the bifilar windings. Even though the higher permeability powdered-iron core showed the best low-frequency response, it wasn't chosen because it should have somewhat greater loss as was evidenced by its lower input impedance values. Until more precise insertion loss data becomes available, I recommend my improved design shown in photo E.

Several other points can be made regarding this design and they are:

1. The core is covered with a layer of 1/2 inch wide Scotch No. 27 glass tape. Even though the bulk-resistivity of 10^6 to 10^7 ohm-cm of No. 2 powdered-iron doesn't appear to require this extra insulation, it gave an added degree of safety margin.

2. No. 14 solid copper wire is now available with a 15 mil thickness of Teflon insulation and can probably be used with a sufficient voltage breakdown margin. It would certainly make it easier to construct this balun.

3. For one needing a balun to match 50 ohm cable to a log-periodic beam with a 200 ohm resonant input impedance, this design looks interesting. It could very likely handle 10 kW of power from 3 to 45 MHz!

Multiband Dipoles

Antenna tuners have been known to work well for some radio amateurs and not for others. This is a result of the differences in the dimensions of their antenna systems. With high impedances seen by the 4:1 baluns in the antenna tuners, the baluns not only fail to provide a good balanced-to-unbalanced conversion, but they can also be damaged by excessive heating. The high-current, low-impedance condition seen by the balun is not a problem. Therefore, the object in multiband antenna design is to provide the most favorable impedances for the baluns, especially on the three lowest frequency bands—40, 80, and 160 meters. Usually on the higher frequency bands, the impedances seen by the baluns are not as high and the balun's choking reactances are greater (assuring balanced-to-unbalanced conversion). This section treats three cases of multiband center-fed dipole designs, and they are (1) the "worst case" design, (2) a smaller design—the G5RV, and (3) a larger design.

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(1) The "Worst Case" Design. Apparently, a logical design for a multiband dipole is an 80 meter dipole with a quarter-wave open-wire (or twin-lead) feedline. In fig. 8 this would mean that $L_1 = L_2$= 59 to 67 feet, depending upon the favorite operating frequency. Using 450 ohm twin-lead with "open windows," L_2 would be diminished by 10 percent, and with 300 ohm TV twin-lead it would be diminished by about 20 percent. On 160 meters this would make a good antenna system. Since $L_1 + L_2$ is close to a quarter-wave, the current at the input to the feedline is at its highest value and the impedance is at its lowest—a very favorable condition for the balun. In fact, a 1:1 balun at the feedpoint would probably do a good job.

But what does the input to the feedline look like on 80 meters? If 450 ohm feedline is used, the 4:1 balun sees a quarter-wave 450 ohm feedline terminated in about 50 ohms. Transmission-line theory tells us that the balun would see 4050 ohms—an impossible condition for most baluns. But it becomes worse on 40 meters, where it can be a center-fed, full-wave dipole with a half-wave transmission line (a 1:1 matching transformer). This means the balun could see an impedance approaching 10,000 ohms[14]—a more than impossible condition! Although high impedances would also be seen on 10, 15, and 20 meters, the conditions are not quite as severe, since the balun's choking reactances are usually greater and the impedances lower. In essence, the "worst case" design for a 4:1 balun is the "best case" design (except for 160 meters) if one still uses inductive coupling to parallel-tuned circuit.[6]

(2) A Smaller Design—The G5RV. Varney,[15] G5RV, designed a multiband center-fed antenna system capable of operation on all HF bands from 3.5 to 30 MHz. In contrast to multiband antennas designed as half-wave dipoles on 80 meters (the "worst case" design), the full-size G5RV antenna was designed as a three-half-wave antenna on 14,150 MHz with a 1:1 transmission line matching transformer. This was possible using the dimensions of 51 feet for L_1 and 34 feet for L_2. For 450 ohm twin-lead with "windows," L_2 would be 31 feet, and for 300 ohm TV ribbon L_2 would be 28 feet. Thus, the input impedance at the base of the matching transmission line was about 100 ohms on 14,150 MHz and a manageable impedance for 50 or 80 ohm coaxial cable.

With the total length of $L_1 + L_2$ being 85 feet, however, the impedances at the input to the transmission line on 40, 80, and 160 meters are also manageable. Even though they have a reactive component on these bands, they are not that high where a well-designed 4:1 balun in an antenna tuner can't easily handle them. Varney also showed that the highest impedances occurred on the 18, 21, and 28 MHz bands. But this doesn't present a problem with the design in photo E, since it uses an efficient core material and it also has the highest reactances of its windings at these frequencies.

Varney[15] also wrote, in considerable length, on the unsuitability of a balun used to connect the base of the 34 foot open feeders to a coaxial-cable feedline. He states that if a balun is connected to a reactive load with a VSWR of more than 2:1, its internal losses increase. He also mentioned heating of the wires and saturation of the core. Evidently, Varney was not familiar with McCoy's design, which uses a powdered-iron core (with permeability of 10) that can withstand VSWRs considerably greater than 2:1 without showing any temperature rise. Furthermore, the wire doesn't heat up; the core does by dielectric heating. Additionally, with sufficient choking reactance baluns can handle (equally) the resistive and reactive components of an impedance.

And finally, after observing the voltage and current distributions on all of the bands, it appears that a 2:1 (100:50 ohm) balun might be an interesting one to try on the G5RV antenna. It could be that many of the bands would not require the added matching of an antenna tuner. If

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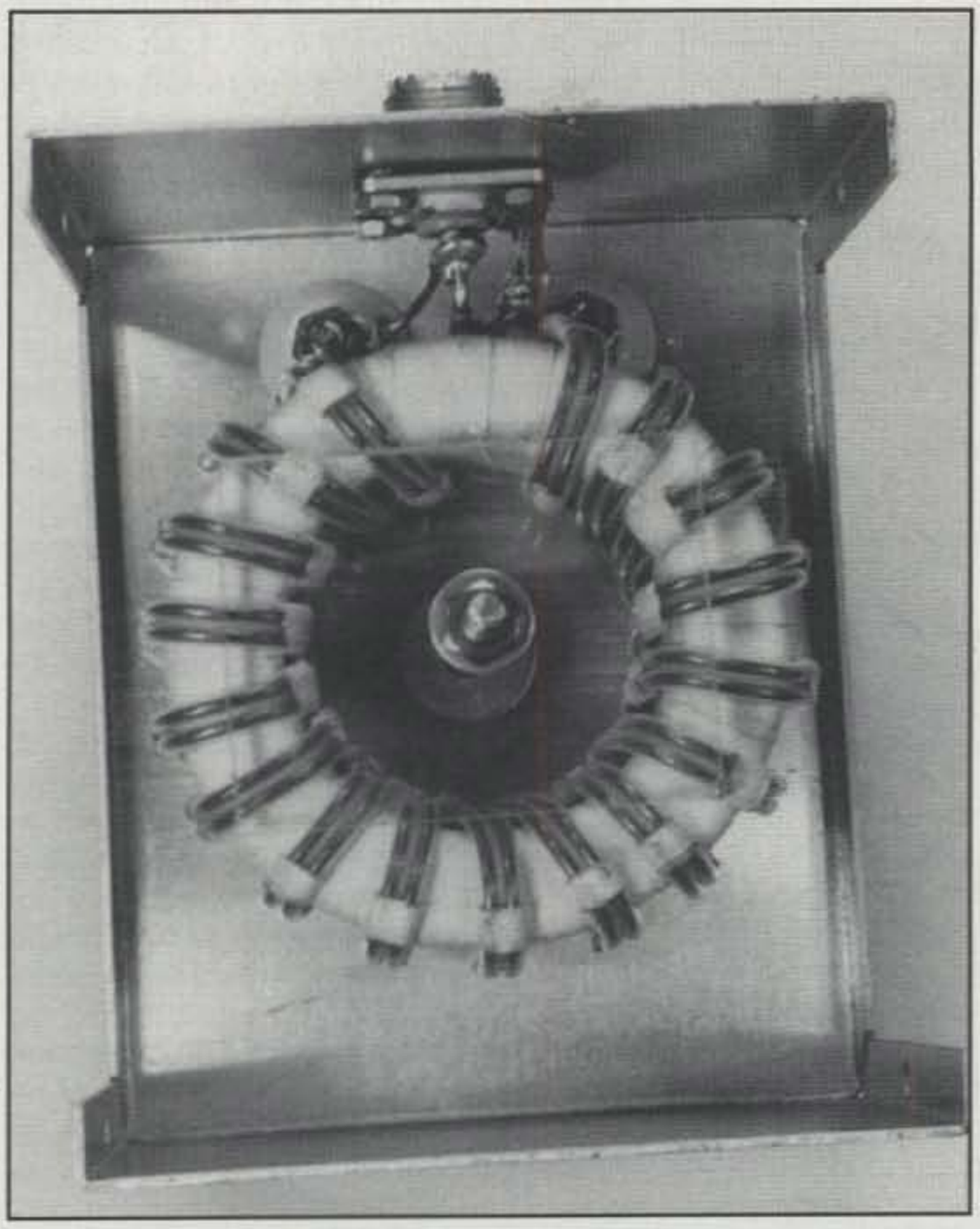

Photo F– The improved 4:1 Ruthroff balun mounted in a 5"L × 4"W × 3"H minibox.

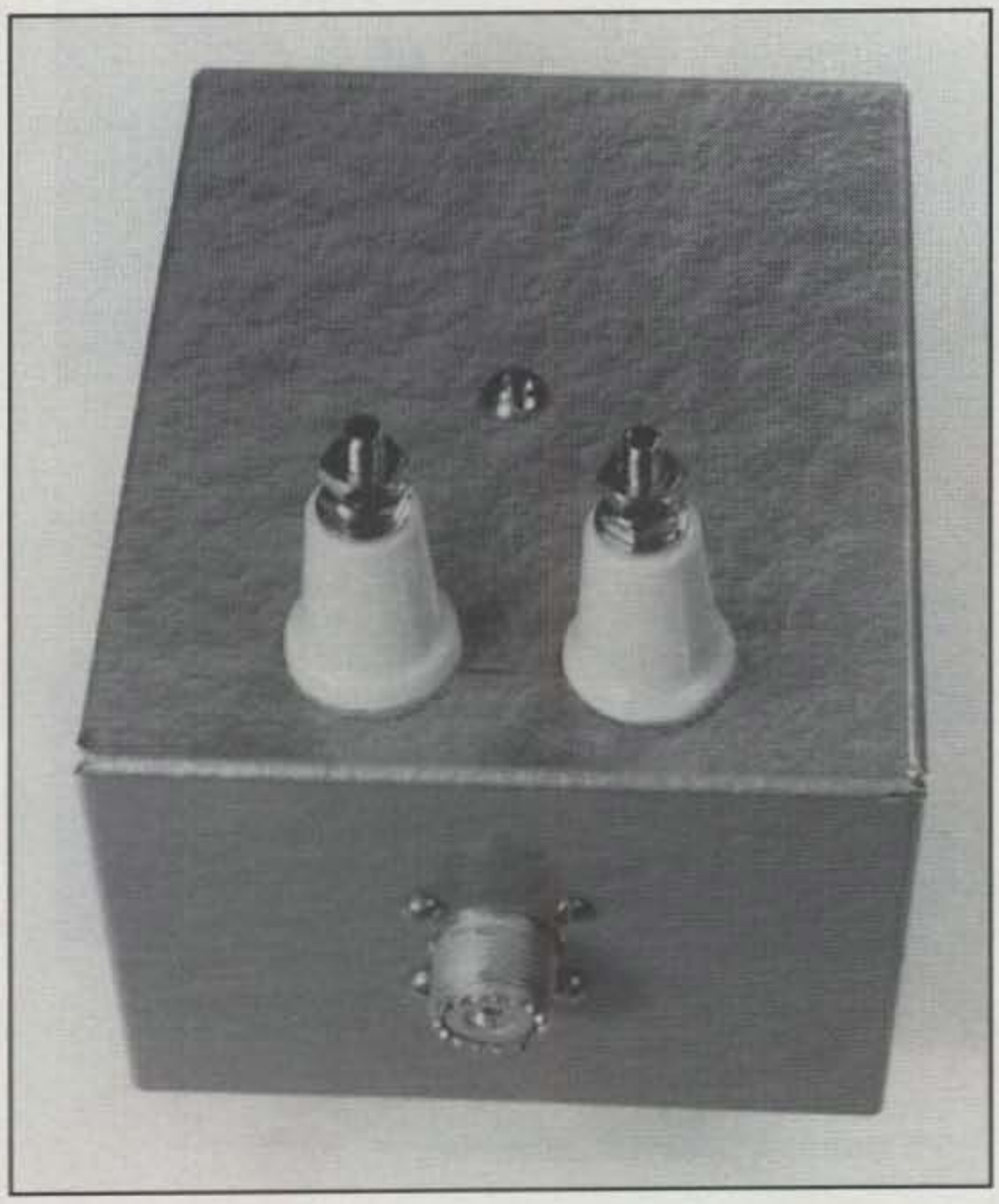

Photo G– The top view of the 4:1 balun of photo F.

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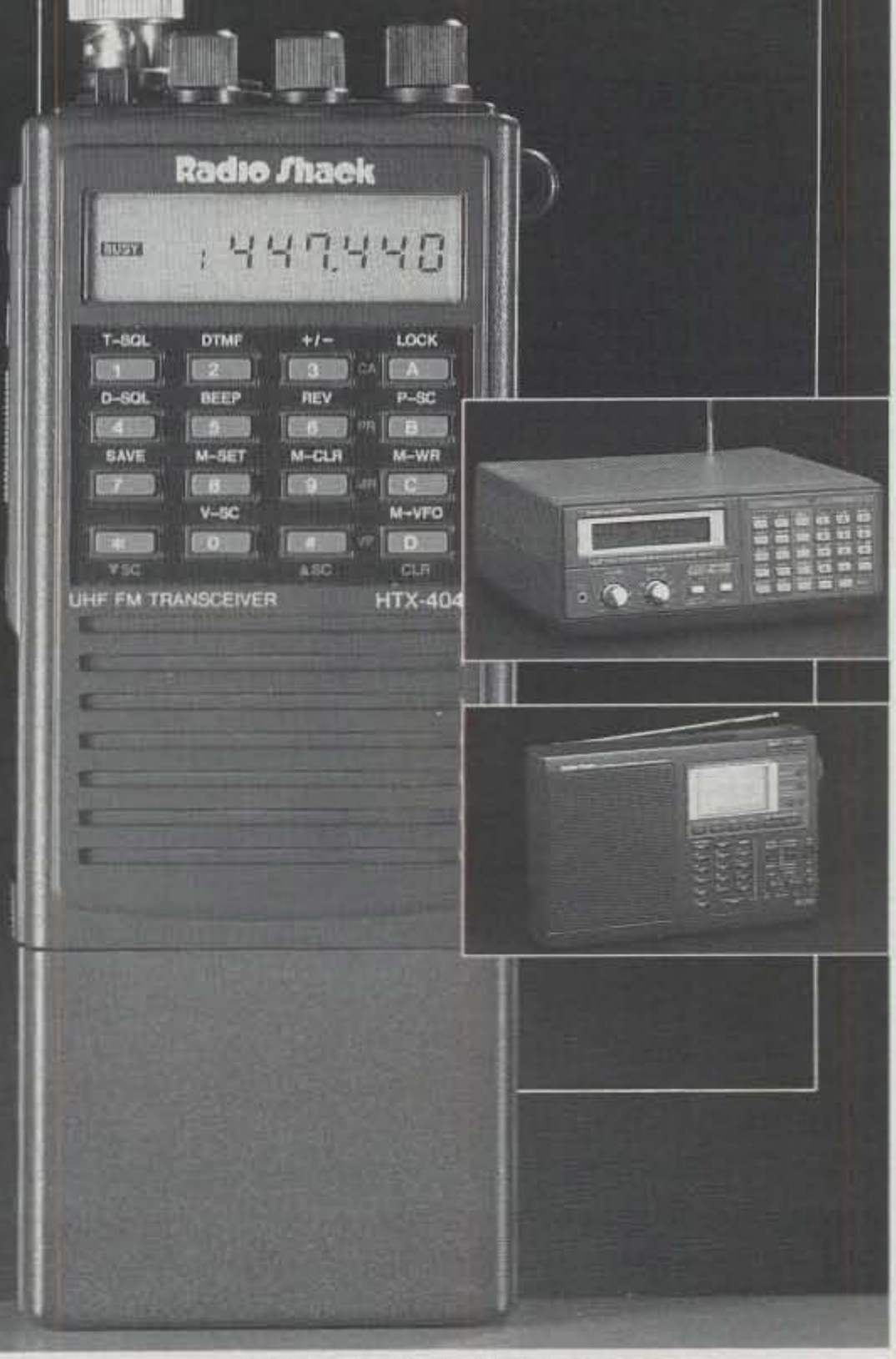


CIRCLE 143 ON READER SERVICE CARD

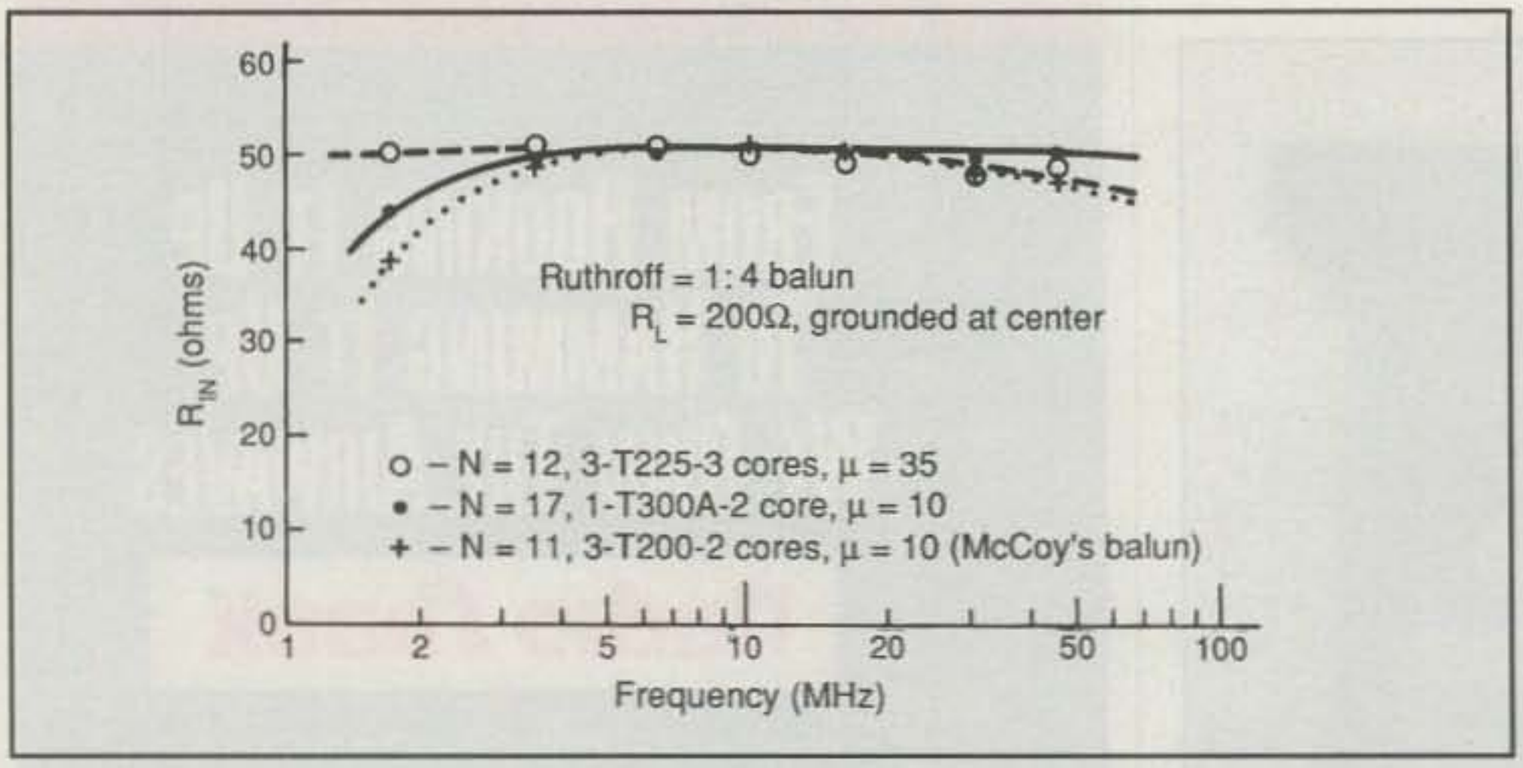


Fig. 7– A comparison of the performance of the McCoy 4:1 balun with a balun having a larger core and more turns and with a balun that has a higher permeability core.

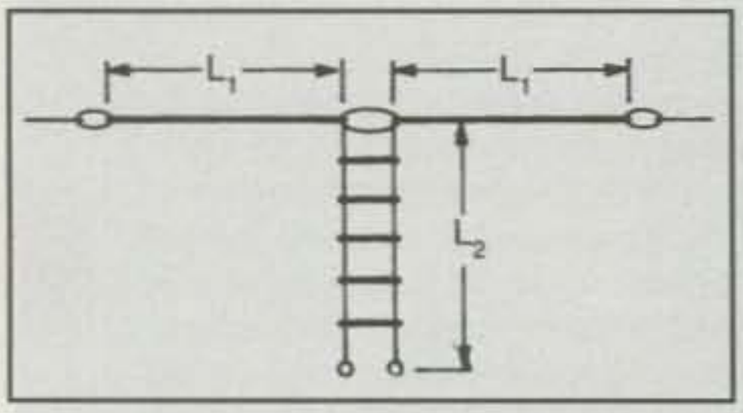


Fig. 8– The symbols used for the dimensions of a center-fed dipole with open-wire feeders (or twin-lead with appropriate consideration of velocity factors).

some of the bands require an antenna tuner, in order to be used, then I would suggest using a "hardened" balun. That is what I call McCoy's approach, which uses efficient and hardy powdered-iron cores. A 2:1 balun, comprised of a 2:1 unun in series with a 1:4 Ruthroff balun, could easily be designed and then constructed.

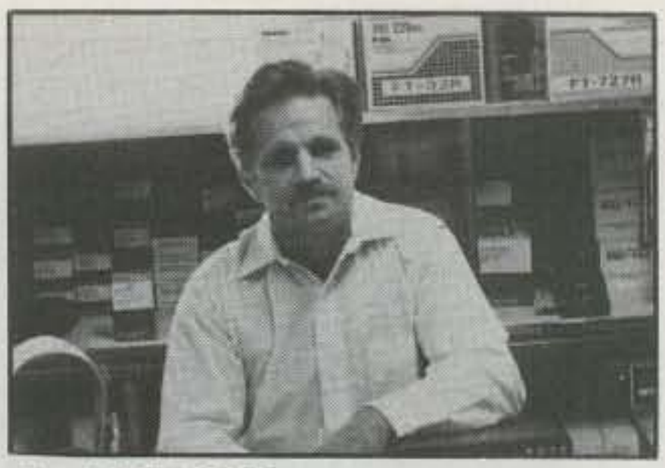
(3) A Larger Design. Even though the G5RV antenna can be made to operate on 160 meters with a suitable antenna tuner, an antenna system larger than the "worst case" design can provide better operation on the 40, 80, and 160 meter bands. As you might expect, an antenna system about twice as large as the G5RV offers these advantages. Suggested dimensions are L_1 = 80 feet and L_2 = 100 feet. If the feedline is 450 ohm twin-line with "windows," then L_2 = 90 feet. If it is 300 ohm TV ribbon, then L_2 = 82 feet. As with the G5RV, it is the total length of L_1 + L_2 that presents favorable or unfavorable impedances to the 4:1 balun in the antenna tuner. Therefore, L_1 and L_2 could both be 90 feet as well. Very little differences in performance would be noticed between these two systems, particularly on the lower-frequency bands. Obviously, other combinations totaling 180 feet are also possible. In the G5RV case, it's 85 feet.

Concluding Remarks

After reading this article, one might think that I have set this technology back a few years by advocating voltage baluns and powdered-iron cores. I have even questioned the professional literature. But my conclusions were really based upon three experimental results. They are (1) Measurements with my resistive bridge on input impedances of 4:1 Ruthroff (voltage) baluns with loads floating and center-tapped-to-ground, (2) VSWR measurements on folded dipoles with various 4:1 baluns (large and small, and there-

Rob, WA3QLS

Gail, KA3ITN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fore with many different lengths of transmission lines), and (3) McCoy's success with his 4:1 balun. Also, as this article points out, it helps to have the dimensions of a multiband, center-fed dipole and feeders favor the operation of a 4:1 balun in antenna tuners. *And*, there is a "worst case" antenna design!

As in many investigations, supplying answers to some questions can lead to other questions that appear to be important. Specifically for powdered-irons, how would permeabilities in the 20 to 35 range work out? Simple impedance measurements show more loss than a material with a permeability of 10 by lower values on input impedances. But accurate insertion loss measurements are needed in order to tell the complete story—the trade-off in efficiency for low-frequency response.

And finally, low-permeability ferrite, such as No. 67 material which has a permeability of 40, also looks interesting for use in baluns for antenna tuners. Accurate insertion loss measurements[13] have also shown the very same high efficiency which was exhibited by powdered-iron with a permeability of 10. With a sufficient number of turns on an appropriate-size core, a balun with this material could be practical. Even though the amateur radio literature still refers to the problem of core saturation, several other questions come to mind. Has anyone verified (experimentally) core saturation in baluns with ferrite or powdered-iron materials? Additionally, how can the flux be great in the core when the worst case is when the balun sees a high voltage and low current condition? The answers to these questions would be very interesting.

(Kits and finished units are available from Amidon Associates, Inc., 2216 East Gladwick St., Dominguez Hills, CA 90220.)

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Radio FUNdamentals

BY BILL ORR, W6SAI

THINGS TO LEARN, PROJECTS TO BUILD, AND GEAR TO USE

The Coax Balun

Have you read the great series of *CQ* articles on ferrite baluns written by Jerry Sevick, W2FMI? If not, better get out your back copies of this magazine and go over this important and interesting information.

Jerry mentions air-core coax baluns in passing, but the main theme of his work deals with ferrite-core devices. However, there is a place in the world for the air-core design, and I'd like to discuss here two interesting, inexpensive baluns of this type.

An advantage of the ferrite-core balun is it has a greater frequency range and is usually more compact than its air-core counterpart. And conversely, the air-core balun is larger and more bulky than the ferrite equivalent, especially if the former is wound with coax as the conductor.

The air-core coax balun, on the other hand, can be made cheaply and is not subject to core saturation, which can cause a number of unpleasant things to happen. The balun core can saturate and overheat with accompanying power loss, causing an increase in harmonic generation and intermodulation.

It is interesting and easy to build an air-core balun, and here are some coax types with which you can experiment and draw your own conclusions as to their utility.

The 1-to-1 Coax Balun

The first I read of a wideband coax balun was in the 1959 publication *Principles of Single Sideband*, published by the Collins Radio Company. This book discussed baluns in the chapter describing feed systems suited to 52 ohm coax line (which had become the feedline of choice in the 1950s). A simple parallel-conductor balun was described (fig. 1). This device converts an unbalanced line to a balanced load, as any unbalanced currents flowing from A to C due to its direct connection to the antenna will be cancelled at C by the exact counterpart of current flowing from B to C. Thus, there is no current flowing on the outside of the coax beyond point C.

The length of the balun (L) need not be a quarter-wavelength for the cancelling effect to take place, but any departure of magnitude from this length will upset the 1-to-1 ratio of the balun. Unfortunately, this linear balun is not a broadband device. In addition, it is cumbersome, so it was not generally used with amateur antennas.

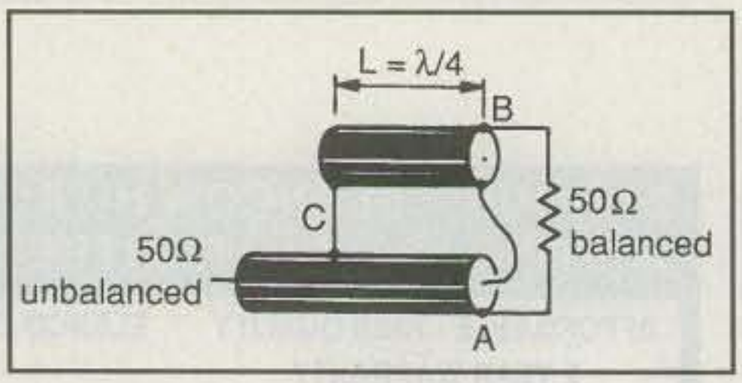

Fig. 1– Parallel-conductor type balun with 1:1 impedance transfer.

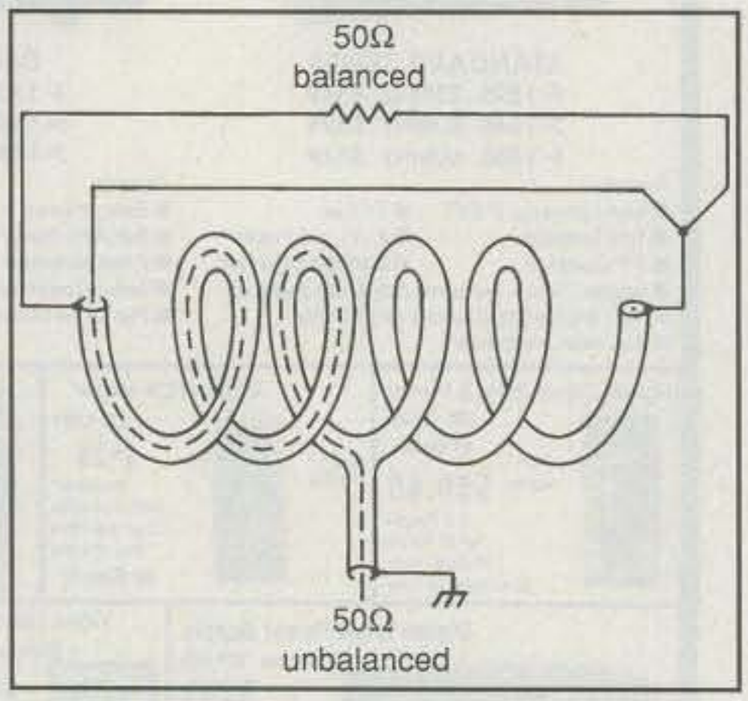

Fig. 2– Broad-band coax balun with 1:1 impedance transformation. Center conductor of right-hand coil is unused.

A form of broadband coax balun which is very useful in amateur service is shown in fig. 2. It may be visualized as the balun of fig. 1 wound into a coil. This physical representation does not cover the real operation of the device, which is somewhat more complex. However, a coiled coax balun is capable of operating over a much wider range of frequencies than is its linear counterpart, shown in fig. 1, without upsetting the impedance at the output termination.

The coax balun is wound to a diameter limited by the bending radius of the coax (about 15 times the cable diameter). The ends of the resulting coil are then symmetrically trimmed until resonance is achieved at the desired frequency, which is usually the mean frequency of the range of operation. The trimming is done with the aid of a dip meter with the balun disconnected from the load and the transmission line and with the loop connection open.

No more information of a helpful nature was provided in the Collins book, so it was left to the reader to build up a balun and try out the idea. I proceeded to do this.[1]

A Practical Coax Balun For 7 to 30 MHz

Operation of the broadband coax balun may be seen from the analogy shown in fig. 3. In (A) is a drawing of a balun known as a "ladder transformer" in TV service. This balun can be compared to a multiple-winding inductor (B), with the exciting voltage applied to one winding. Voltage across each coil is equal, and proper polarization of the windings provides output voltage balanced to ground. An equivalent HF balun can consist of three windings, two of which may be made of coax, and the third winding a single section of wire. In most cases, for symmetry and ease of construction, it is made of a matching length of coax cable. In this case, the inner and outer conductors of this section are shorted together.

The input and output terminations of the balun may be transposed, if desired, for easier physical attachment to the antenna (fig. 4). Operation of the balun is the same in either case.

I made up a balun consisting of a length of RG-213/U coax 16 ft. 6 in. long, wound into a single-layer coil the inside diameter of which was 6¾ inches. This resulted in a 9-turn coil, with a couple of inches left at each end for connections. I used a section of gray PVC water pipe as the coil form.

I wound the coil on the form temporarily and marked the points on the PVC corresponding to the ends of the winding. I then removed the winding and drilled small holes through the wall of the form at each spot previously marked with the pencil. The coil was then rewound on the form and held in place temporarily with plastic wire wraps passed through the holes I had just drilled. The center junction of the winding is exactly 4½ turns

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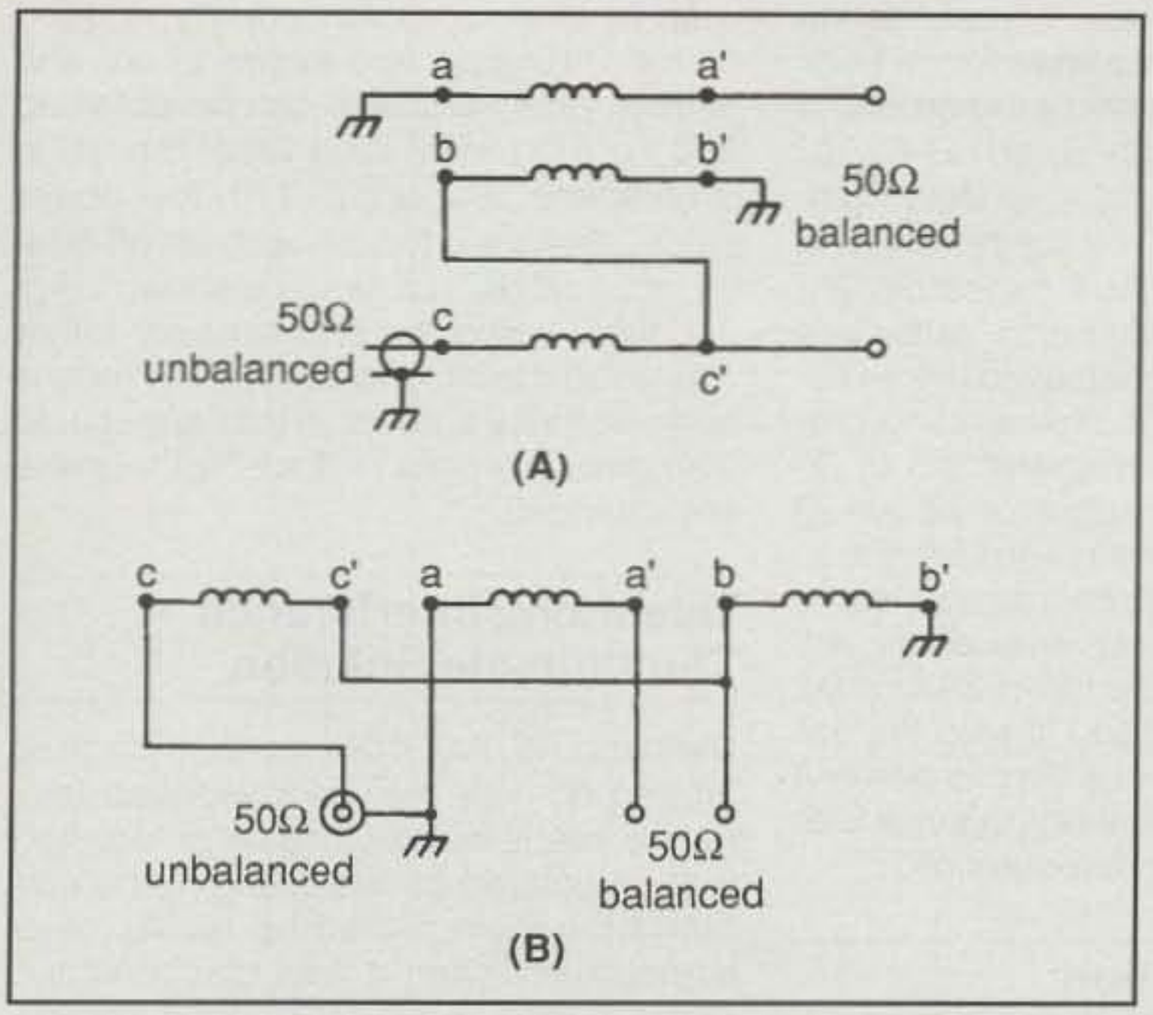
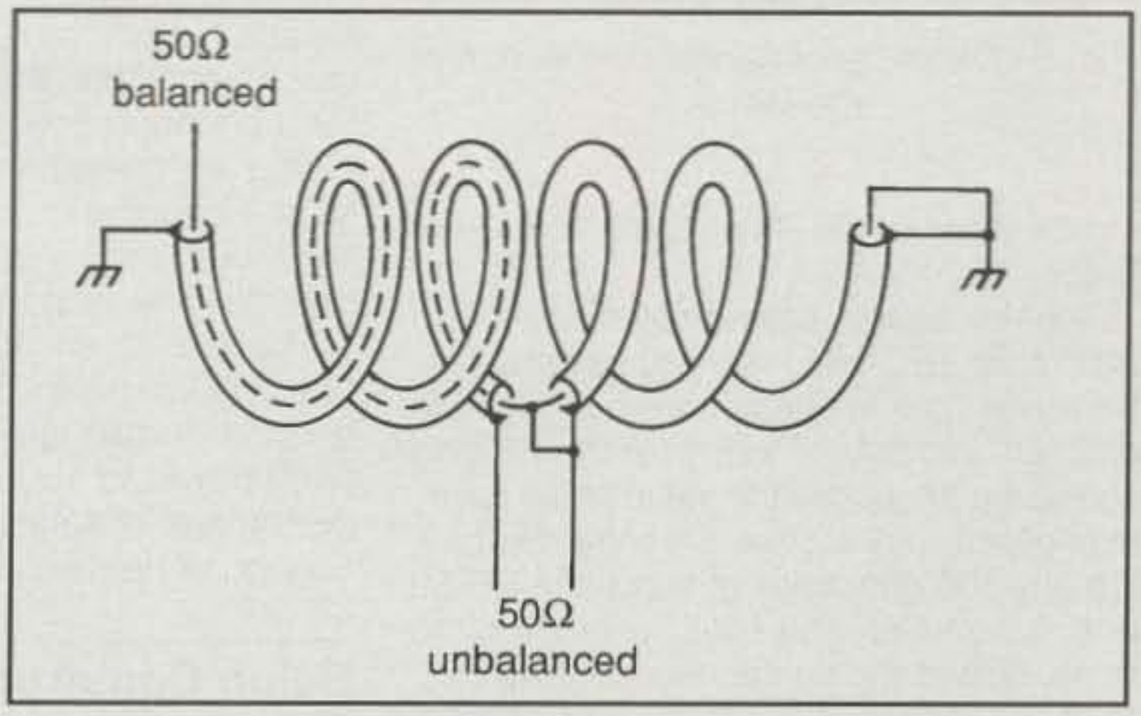


← *Fig. 3– "Ladder balun" shown at (A) redrawn as a transformer with identical windings (B).*

Fig. 4– Reverse-connected 1:1 balun. Inner and outer conductors of right-hand coil are connected to preserve symmetry.↓



from each end of the coil. I next carefully marked the center point, unwound the coil, and made the center connections shown in fig. 5. Once these were made, I sealed the joint with Coax-seal® tape and rewound the coax on the coil, then fastening it permanently in place with new wire wraps. Additional holes may be drilled near the center of the winding to allow additional wraps to be placed at this point.

The range over which the balun provides good isolation is approximately 6 to 30 MHz.

The 4:1 Coax Balun

This design may be converted into a 4:1 transformer by a change in the configuration. The balun of fig. 4 is connected to place the input terminations in parallel and the output terminations in series (see fig. 6).

A variation of this type of balun was described by Dick Rollema, PAØSE, in *Electron*, a Netherlands publication. It was translated into English and reprinted in the August 1992 issue of *Radio Communication*,

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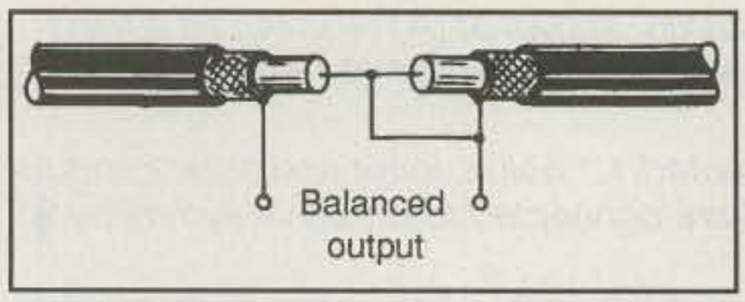

Fig. 5– Close-up of center connection of the balun.

a publication of the Radio Society of Great Britain.

The 4:1 design uses small-diameter 75 ohm coax (RG-59/U, or equivalent). This particular coax is chosen, even though the optimum impedance value for the winding should be about half the value of the terminating load—in this case 200 ohms. Not having any 100 ohm coax at hand, the RG-59 was substituted. The balun consists of 16 turns, split at the center, wound on a PVC form 3½ inches in diameter and about 6 inches long. Instead of making the balun of a single, tapped length of coax, two separate pieces were used, making in effect, two adjacent coils, each with eight turns of coax.

The balun windings are cross-connected at the ends (A to A and C to C). I used short pieces of No. 12 stranded hookup wire to do the job.

I built up a balun and it worked okay, but I felt that I could obtain a more constant transformation ratio across the HF bands if I used a higher impedance coax for the winding. After snooping around, I found that The Wireman[2] listed RG-62A/U (95 ohm) coax in their catalog (stock number 141). I ordered 20 feet of this line and rewound the balun. As I expected, the balance and transformation ratio was much better than that achieved in the RG-59/U configuration, the new winding providing an operating range of 3.5 to 30 MHz. Performance dropped off above 29 MHz, but I think this was probably due to my relatively long interconnecting leads.

The maximum power level of the 4:1 balun is unknown. The RG- 62A/U coax is rather fragile stuff, so I limited the applied power to 150 watts. At this power it performed in a satisfactory manner with no sign of heating or deterioration.

Balun Construction

The ends of the coax windings are the weak points of the coax baluns. The outer conductor must be tinned, and the inner conductor protected from physical strain. After the terminating leads are attached, the coax ends must be protected from the weather with Coax-seal®, or the equivalent. Balun mounting will depend upon the individual installation.

I found that black ABS plastic pipe used for drain lines was equally as good as the PVC pipe and easier to cut and handle. ABS end caps can be obtained and epoxied in position when the balun is complete. An outline of my low-power balun, designed for use with an off-center fed, multiband antenna is shown in fig. 7. I didn't epoxy the end caps on; rather I fastened them to the coil form by means of sheet-metal screws. In that way I could dismantle the balun if I wished to make any changes.

Telephone Interference The Ultimate Solution

My friend Tiff, W6GNX, has been plagued off and on over the years with bad telephone interference. Once he discovered that an unused phone sitting in the corner of the room picked up his 40 meter signal even when it was disconnected from the line! And the telephone answering machine was a puzzlement. Interference on it varied, depending on where it was placed in the house, and moving some telephones from room to room created different levels of interference in them. Line filters, such as described in my past columns, helped some phones, but there were other phones, Tiff found, that even the best line filter could not completely help.

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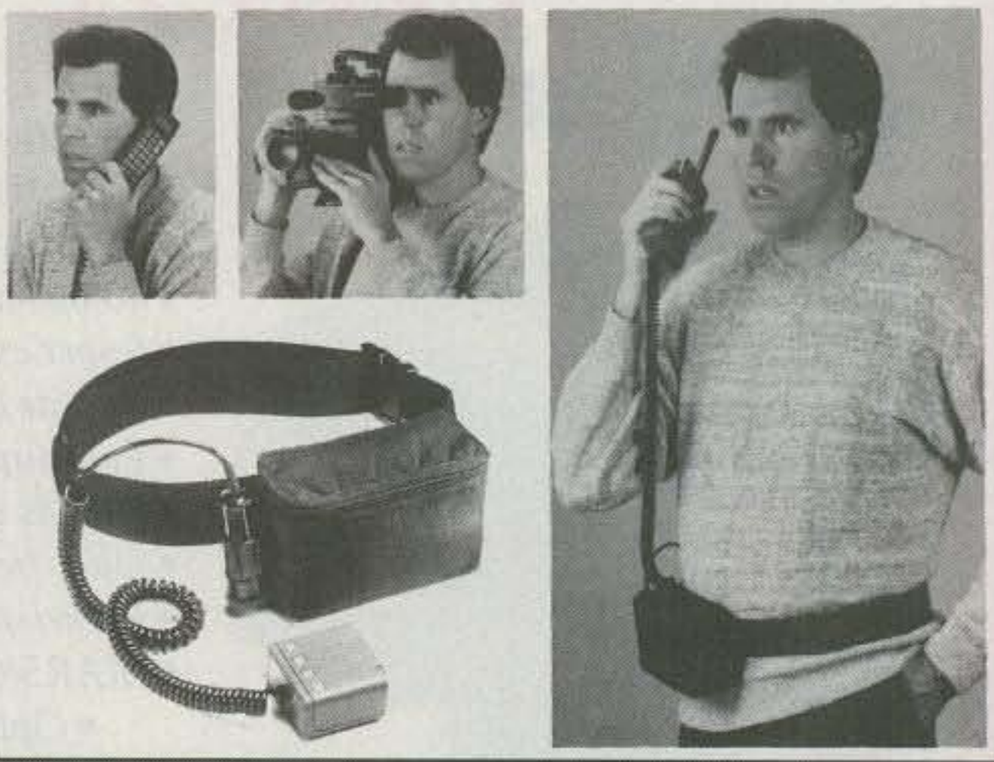

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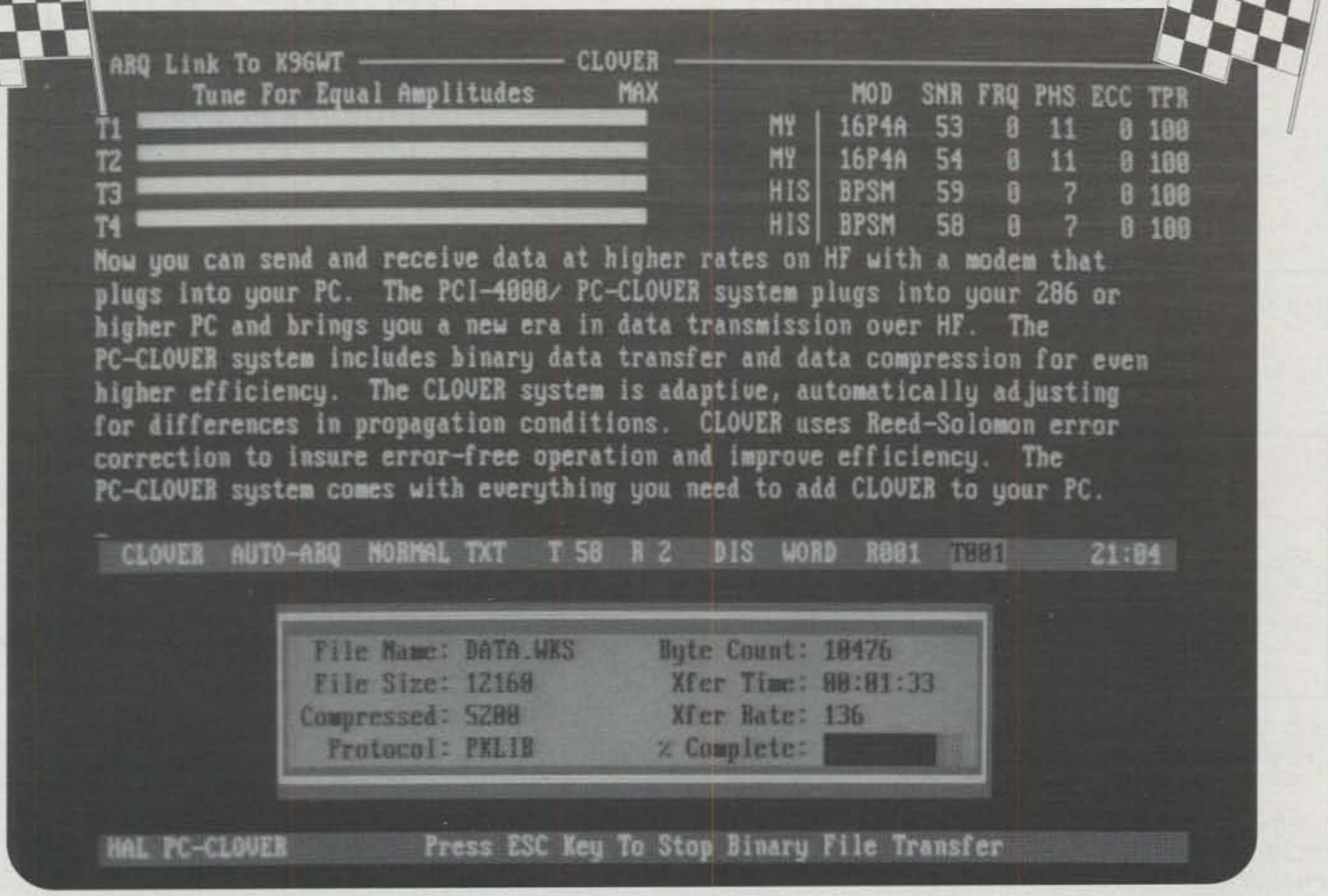

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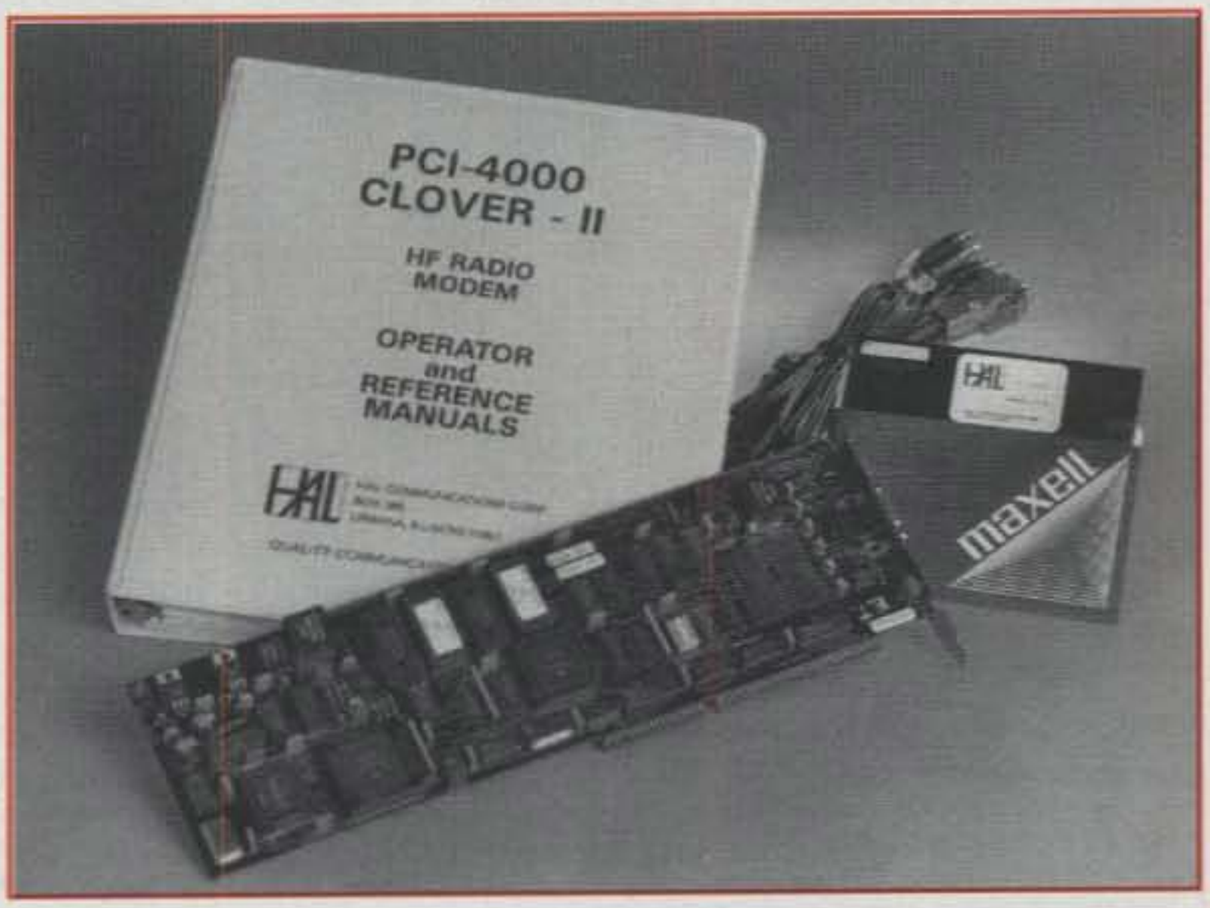

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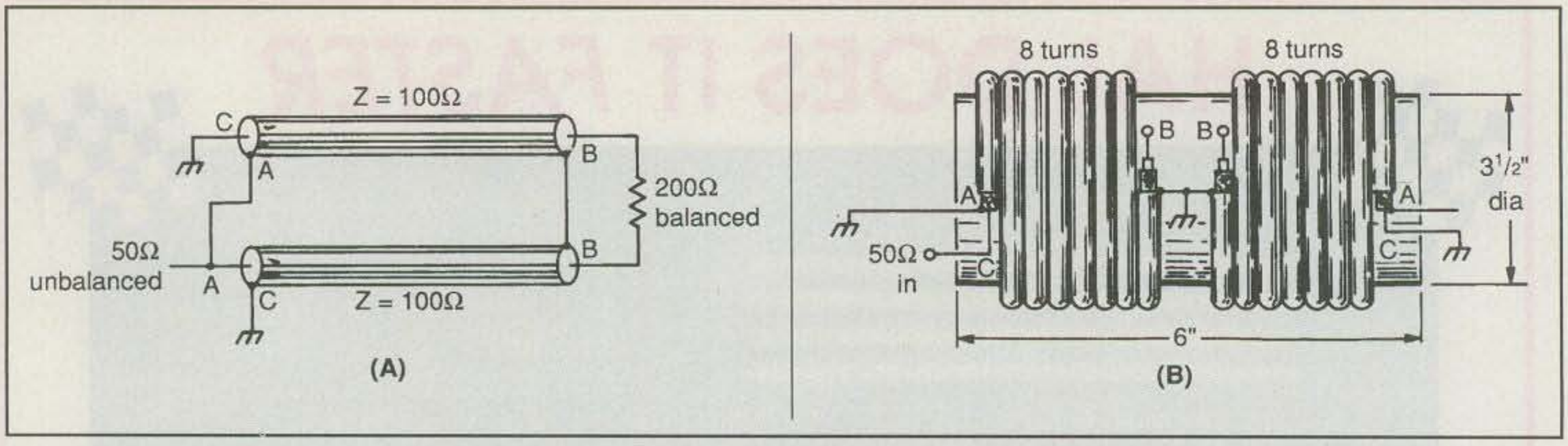

Fig. 6– (A) 4:1 linear balun. Short-circuit between A and B is remedied by the self-inductance created by coiling the coax as in illustration (B). Balanced antenna load connects to B-B.

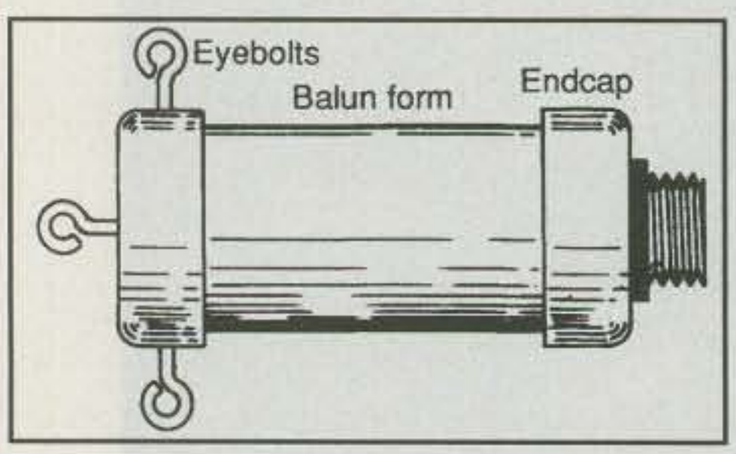

Fig. 7– Physical layout of balun. Side eyebolts are for antenna connections.

Tiff's conclusion was that interference could come from telephone line pickup of the signal, and also from direct pickup by the electronic circuitry of the phone itself. This resolves the interference problem into two parts: cleaning up the telephone lines and cleaning up RFI-sensitive instruments. A lot of thought has been given to the second part of the problem, but not much attention has been paid to the first part.

Most telephones could be cleaned up on a one-by-one basis, but what about pickup by the telephone line itself? A "clean" phone connected to a line that acts as an antenna is self-defeating. The phone line must be decoupled from the antenna to set things right.

One solution is to move the transmitting antenna farther away from the telephone system. But this is not always possible, especially in an urban neighborhood.

The W6GNX 40 meter antenna is a dipole about 45 feet high, strung between the main tower and a pole at the opposite end of the yard. Unfortunately, the dipole runs parallel to the phone line in the house. At one end of the house the line runs from a junction box out to a nearby telephone pole.

Tiff verified this by crawling up into the attic space to locate the phone line. Sure enough, it ran along the underside of the roof rafters, parallel to the 40 meter antenna. Worst of all, at each telephone jack the wire doubled down the inside of the wall to the jack and came up again to the attic space to run to the next jack! There was over 400 feet of telephone wire running inside the house from one end to the other (fig. 8)!

A quick check with a friend of mine who was a building contractor confirmed that this is a common way of wiring homes today. It is called a "daisy chain." If the electrician installed the line before the framing was completed, the chain ran along below the floor joists. If, however, the framing was complete, it was easier and quicker to run the chain through the area between the ceiling and the roof. After all, with high labor costs, the quickest way is the cheapest way, and man hours are a lot more expensive than wire!

Rip It Out And Start Over!

Tiff reasoned it was useless to try to clean up the telephone lines running all through the attic area. He could possibly put RF chokes in the wires, but at which points would they be effective? It was obvious the wires were "hot" and reradiating his 40 meter signal all through the house.

With his characteristic energy, Tiff decided to bite the bullet and rewire his house telephone circuitry, eliminating the wires in the attic area completely. His solution was simple. He bought several hundred feet of two-conductor, shielded computer cable. This was specified as "Multi-conductor, Foil Shield, UL2464 CSA T-1 or T-2 NEC Type CL2 and CM." It consisted of two insulated #22 stranded wires plus a foil shield wrap and a drain wire, all incased in a gray PVC jacket, about 0.175 inch in diameter. The manufacturer of this particular cable coded it "Carol C-0760."

He ran the new cable around the lower outside perimeter of the house, encasing it in ½ inch PVC pipe for physical protection. Plastic outlet boxes were attatched to the outer wall at the appropriate cutouts, and a short stub was run through the wall to a terminal box located within the house. The shielded cable was run through the PVC pipe as the work progressed.

At each outlet box the drain wire (the shield) was continued to the next wire section, providing a continuous shield running the length of the telephone line. Tiff reasoned that the shielding, plus the close proximity to ground of the chain, would do away with the annoying interference.

The next question was the drop-cord

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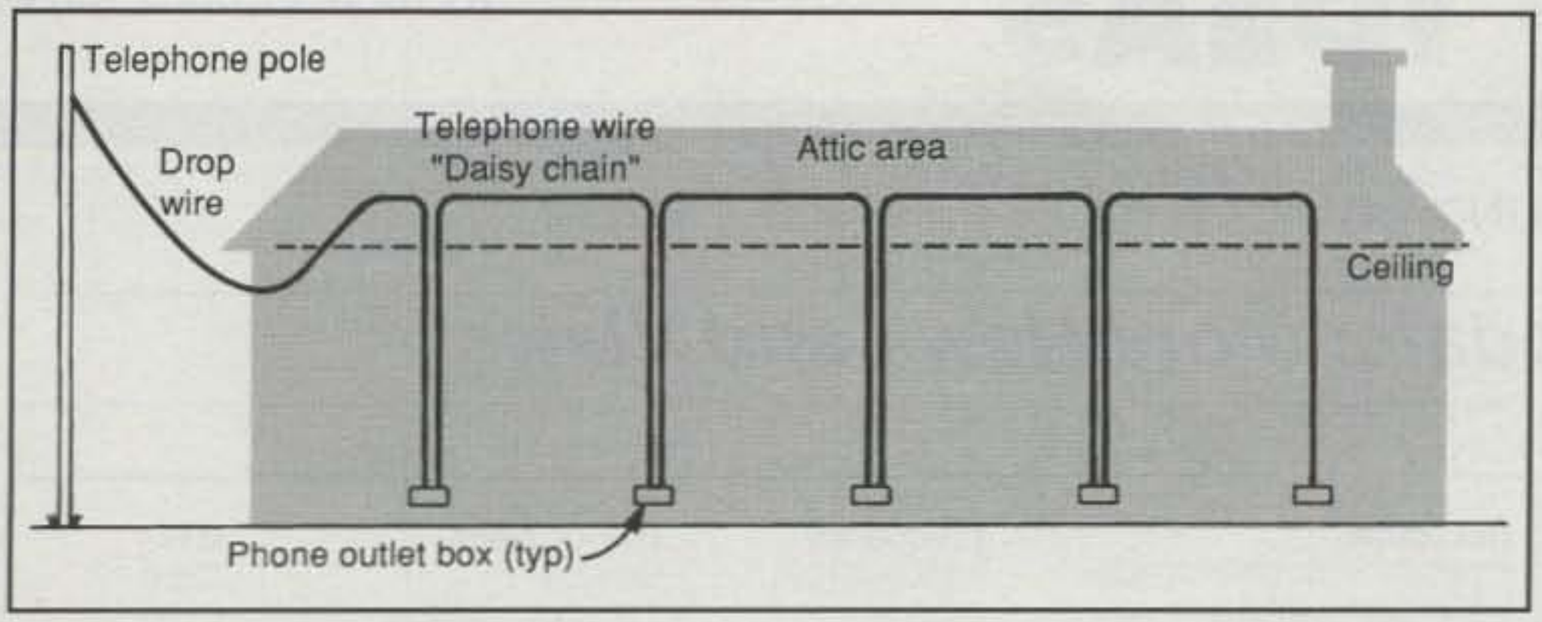

Fig. 8– Telephones wired in "daisy chain" running through attic area and down inside of walls to floor-level jacks. New shielded telephone line runs close to ground level.

from the telephone pole to the house. This was telephone company property and not to be touched. Tiff therefore put an RF filter (such as described in my earlier columns) at the point his new wiring met the drop cord.

The remaining problem was where to ground the shield of the coax line. At the drop cord? At the transmitter? Tiff had a good ground at the transmitter, so he chose that spot. The drain line was connected to the station ground, which was at the base of his tower, just outside the shack window.

Once the job was done, Tiff connected all the phones and gave the system a "smoke test." When 40 meters was relatively quiet, he picked a clear spot and went on the air, modulating his transmitter with an audio tone. No sound could be heard in any telephone—except a weak signal in the telephone answering machine on his operating desk.

This was a lot better than before, as the phone system had been nearly unusable when Tiff was on 40 meters. Now all he had to do was clean up the answering machine. A peek at the innards revealed an unshielded circuit board full of ICs, diodes, various components, and a lot of long, interconnecting leads. In brief, it functioned as an efficient radio receiver!

What to do? The daisy chain was clean, all other phones were clean, but this pesky device was still able to pick up his 40 meter signal and pump it (weakly) into the phone system. As Tiff said, all it needed was a beat-oscillator to be a good SSB receiver! Tune in next month and I'll tell you how Tiff solved this vexing problem.

As a final note, he observed that the SWR response curve of the 40 meter dipole now indicated resonance at the frequency to which he had cut the flattop! When the phone wires were in the attic, the SWR resonance frequency had been offset over 100 kHz! Obviously, there had been tight coupling between the attic wires and the dipole antenna.

The moral of this story is that telephone filters by themselves often won't completely clean up a tough case of interference. The telephone wiring through the house may be picking up such a high RF signal level that the filter can't do its job. Rerouting the telephone line to lessen the pickup may be required. Use a shielded line and keep it close to the ground.

Before you rip out any house wiring, make a schematic drawing of the system, showing any color coding of the wires or other identification that will help you reassemble the system in its proper order. For a two-wire installation, its not hard at all!

The Dead Band Quiz

Many thanks to the following who have sent me personal notes: W2OQI, W9PVD, AA4GR, N4UZ, WB8SFT, and K1KLO. I'm sorry I don't have the time to reply to each of you, but rest assured, your input is appreciated.

The Dead Band Quiz concerned three switches that operate three light bulbs in a closed room. One switch for each bulb? You can only go in the room once. Can you determine which switch operates which bulb?

There are several solutions. Here is one. All switches are initially off. Turn on switch #1 for a few minutes, allowing bulb #1 to get warm. Turn off switch #1 and turn on switch #2. Immediately enter the room and feel the unlit bulbs. The warm unlit bulb is controlled by switch #1, the lit bulb by switch #2, and the cold bulb by switch #3. Got it? Good.

Congratulations to the following who immediately solved this little puzzle: KD4VAU, W5IKB, WN2SQC, W6GPM, WA5JCI, W2LCV, WD9DDO, K2PF, K5RA, KZ1R, AA9DH, W2ZPL, KL7DN, W4GRY, W4GJG, AE5E, W6OK, KB7WJQ, KE4ARH, W6JJZ, W4EHU, NH6ZF, KA3VVC, WA2DWV, WB6BYU, N8SJP, and WB6IYM. And more calls in my next column! 73, Bill, W6SAI

Footnotes

1. Orr, William, W6SAI, "A Broadband Balun for A Buck," *CQ*, February 1966, pp. 42–44.

2. The Wireman, Inc., 261 Pittman Rd., Landrum, SC 29356.

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WORLD OF IDEAS

BY DAVE INGRAM, K4TWJ

A LOOK AT THE WORLD AROUND US

QRP Update: More News and Views

Your requests for more QRP news and views proved the ultimate temptation! Although totally engrossed in writing a new super-book on keys and telegraphy, I could not resist the opportunity to pause briefly and check out recent happenings in the world of low-power amateur radio operating.

We can proudly report this area's popularity continues to grow despite declining sunspot counts. Indeed, an ever-increasing number of operators are kicking off their high-power shoes and having a ball running only a couple of watts power to even basic dipole antennas. Furthermore, several new clubs and newsletters recently joined the scene, and monthly QRP QSO parties are also back in vogue. If you have ever contemplated trying your hand at QRP, now is the time for action!

The world of QRP truly holds something for everyone. First and foremost is the thrill of homebrewing the smallest possible rig and then using it to communicate over the longest possible distance. Next is the personal gratification of proving "the operator rather than the rig makes the difference." Third is the economy factor (QRP rigs are low enough in cost so that you can build a dozen of them for various applications). Fourth is the extensive QRP awards program, and fifth brings in the specialized area of milliwatting, and the list of attributes continues. In other words, QRPing is terrific and we want you to join the fun!

Instant Gratification

Thanks to expanded on-the-air activity and enthusiastic clubs, working QRP is more exciting than ever before. You can build or purchase a low-power rig today, for example, fire up on 10.123 MHz at 0200 GMT on Monday evenings, 7.030 MHz at 0100 GMT Tuesday evenings, or 14.060 MHz at 2300 GMT Sunday afternoons, and contact other QRPers right off the bat. What a terrific way to check out a new rig and experience QRP success at the same time!

If you are using 1 watt and work another station 1000 miles away or use 2 watts and QSO someone 2000 miles away, you also qualify for the famous 1000 Miles-Per-Watt QRP award. Additional information on various QRP clubs and awards is also available right on the spot, which means you can become a big-time QRPer the same day. But that is only the beginning. A more complete listing of activities is shown in Table I.

Net Name	Frequency	Day of Week	UTC
CW/SSB TCN (ARP ARCI)	14060–14061	Sunday	2300
SEN (QRP ARCI)	7030	Tuesday evening	0100
NorthWest QRP	101213	Monday evening	0200
Michigan QRP	3535	Tuesday evening	0200
New England QRP (SSB)	3855	Monday	0200
BC Group (SB)	3729	Every evening	0300/0530
GSN (QRP ARCI)	3560	Wednesday evening	0200
GLN (QRP ARCI)	3560	Wednesday evening	0200
WSN-80 (QRP ARCI)	3560	Wednesday evening	0300
NEIQS (NE Illinois QRP)	3560	Thursday	0200
NEN (QRP ARCI)	7040	Saturday	1300
NorthWest QRP ragchew	7035	Saturday	7:30 AM
WSN-40 (QRP ARCI)	7040	Saturday	1700
OK QRP Group	7060 or 3560	Sunday	1330
TCSN (QRP ARCI)	28332	Sunday	1900

Table I– Outline of presently active QRP nets according to frequency, day of week, and time. Most popular are the Monday evening 30 meter net, Tuesday evening 40 meter net,and Sunday evening 20 meter net. (Thanks to NorthWest QRP Club for this info.)

I am also proud to announce the popular informal QRP QSO parties held during the first Sunday of each month have recently been reactivated, and they are terrific weekend pursuits open to QRPers everywhere. These parties are designed specifically for laid-back QRP fun and are not contests. There are no scores to tally, and the only rule is enjoying friendly QSOs. QRPers typically start the day working lower bands such as 80 and 40 meters, move up to higher bands as the day progresses, and then shift back to lower bands as the evening approaches. Working the WARCs is also encouraged, especially if a major contest falls on the first Sunday of a month.

How do you join the action? Simply tune in any of the popular QRP operating frequencies shown in Table II and begin calling "CQ QRP de (your call)." Exchanges beyond that point can include anything from the usual RST, name, and QTH, to long-winded ragchews, as desired. We look forward to seeing you in upcoming "first Sunday of the month" QSO parties and encourage you to join one or more of the major QRP clubs in the near future.

One of the most impressive new clubs I have seen is the Northwest QRP Club based in Washington state. This group's endorsement of 30 meters and their outstanding bi-monthly "NWQ Newsletter" are equaled only by their associated "30-30" QRP transmitter kit and mating receiver projects. The transmitter kit, designed by KG7CR, was sold out when I wrote this column, but it may be available again by the time this appears in print. It runs 5 watts output; has prewound coils, a case, instructions; and comes complete with 10.123 MHz crystal.

Membership in the NWQ Club, which includes a one-year subscription to the newsletter, is available for $10. Contact Bill Todd, N7MFB, the Northwest QRP Club, 4153 49th Avenue SW, Seattle, WA 98116 for more details.

Homebrewing Made Easy

Homebrewing low-power transmitters and simple direct-conversion receivers is yet another personally rewarding aspect of QRP, especially when you have the right support equipment. One of the most handy aids I have found is a circuit assembly and test block similar to the one shown in photo 1. This little gem is available from Radio Shacks and various electronic suppliers nationwide. It is perfect for quick-assembling a circuit you may wish to modify or swapping component values before building the final version on a perfboard. The test block has an electrically-insulated center divider with a matrix of pushpin-type fittings that accept regular resistor and capacitor-size leads on both sides. Each row of fittings is interconnected diagonally and insulated from

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Band	CW	SSB	Novice
160	1810	1910	—
80	3560	3985	3710
40	7040	7285	7110
30	10106	—	—
20	14060	14285	—
17	18080	18130	—
15	21060	21385	21110
12	24910	24950	—
0	28060	28385	28110

Table II– Popular HF QRP operating frequencies. Although not shown, 10.123 MHz is also active on 30 meters.

adjacent rows to make circuit assembly quick and easy.

Three mini-rigs are shown on my test block in photo 1: a one-IC transmitter on the left, a 350 mw one-transistor transmitter in the middle, and an LM-386 audio amplifier on the right. This photo was shot while I was working on a single transistor and IC transceiver for 30 meters. I am presently spending most of my time writing my new book, so the test block still sits wrapped in a plastic bag awaiting further development. Surely more spare time will be available in 1994!

Another convenient item for assembling small rigs on PC boards is the "Third Hand" with magnifier as shown in photo 2. This item was purchased at a hamfest, where they can often be found, or full-line electronic parts places may have them. The Third Hand has a heavy metal base and horizontal arm with adjustable brackets on each end. Alligator clips are attached to the brackets and move in any direction so you can position the holder and magnifier to any desired angle. After setting up a project for component insertion and soldering, you move the magnifier into position and lock its set screw. Both hands are then free to hold a soldering iron and solder while working with pinpoint accuracy. Needless to say, this Third Hand has proven a real asset for assembling miniature QRP rigs.

The magnified PC board shown in photo 2, incidentally, is the new 1 inch wide "modified Oner" that was recently announced by 624 Kits Company. With the aid of the Third Hand, I built the transmitter in less than an hour. Without the Third Hand, I could have spent over an hour simply trying to find all the correct holes to insert components. If you seriously pursue building QRP projects, a Third Hand is one of the best investments you could make.

The World's Smallest Mobile

Our September column featured views of the first HF mobile setup (a 1919 car and rig owned by A. H. Grebe), so it is only fit-

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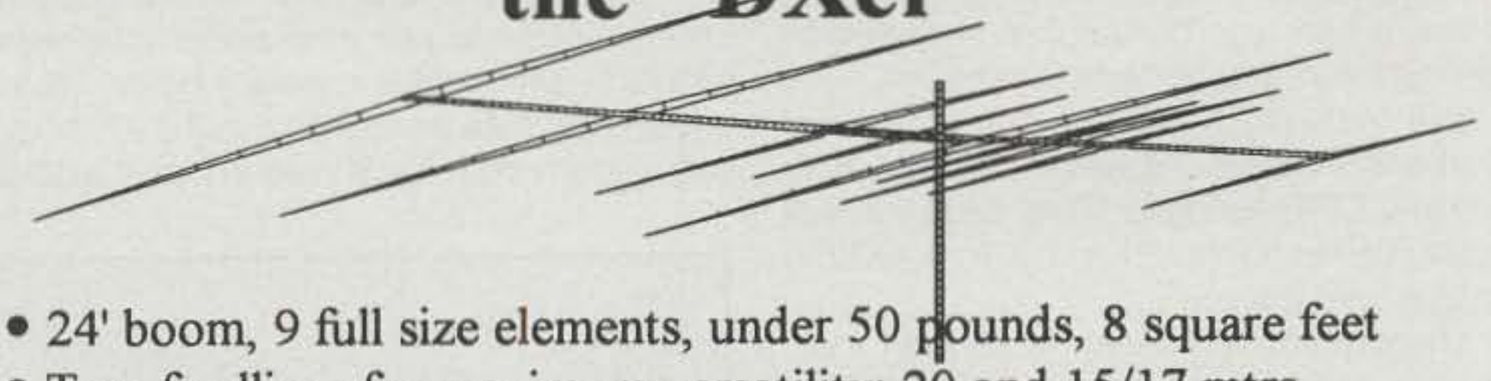
Dream 2: for the low sun spot times.....20/17/15 Mtrs

the "DXer"



- 24' boom, 9 full size elements, under 50 pounds, 8 square feet
- Two feedlines for maximum versatility: 20 and 15/17 mtrs
- Forward stagger design: 20 is behind the critical section of 15/17
- No traps or log cells - just great performance
- 3 element 20, plus the NOMAD 15/17 mtr duobander
- 80 mph+ wind survival and low mast torque
- Elements prealigned on the boom, low profile, strong construction
- At ***$675***, another dream come true; via U.P.S.

Ken Rae, WB0POP, purchased DXer #1 for his cabin station and got another for his home station in Denver - thanks for pushing us, Ken!

There's much, much more to the FORCE 12 story. Contact Tom Schiller, N6BT, at **(408) 988-2766** or **(800) 248-1985**, or FAX him at **(408) 988-2767**. Tom's got a beam with your name on it.

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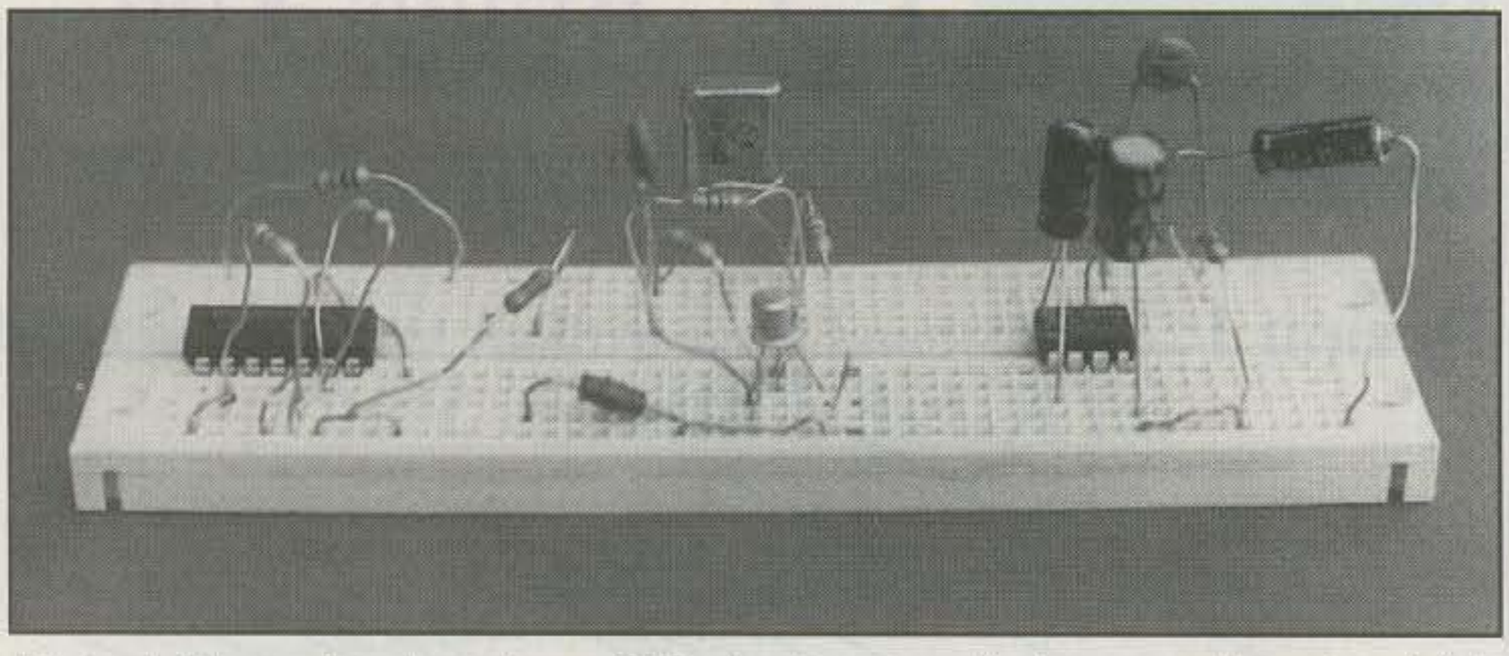

Photo 1– Three of my homebrew QRP circuits assembled on a test board available through Radio Shacks and electronic suppliers nationwide. This little test block really makes checking out designs easy.

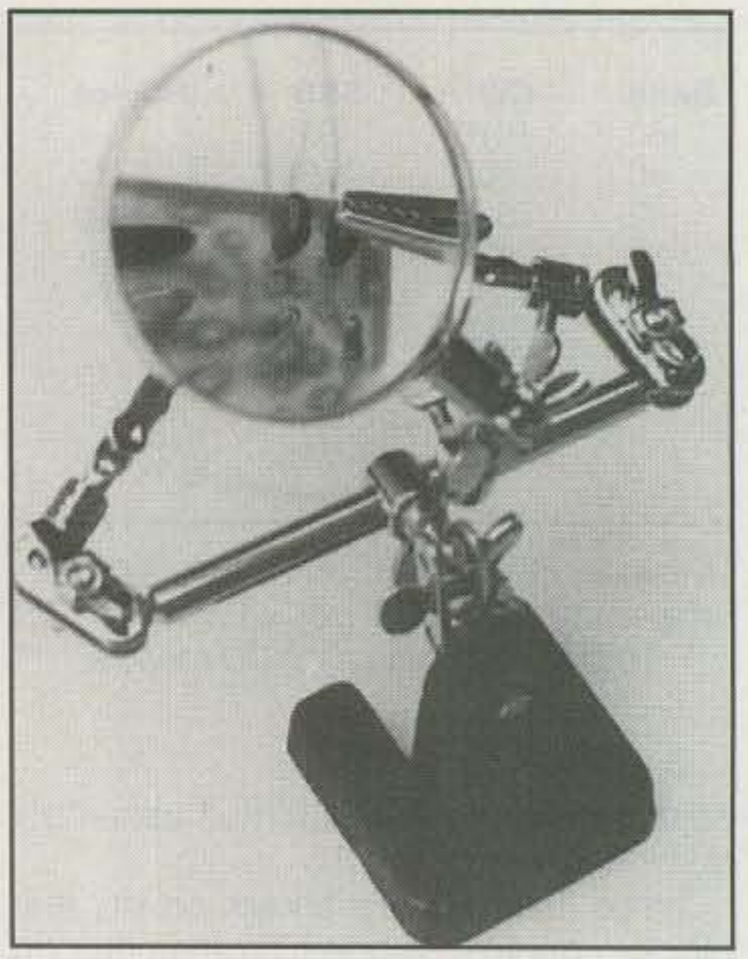

Photo 2– Third Hand adapter used for assembling PC-board-type QRP circuits. You are looking through the magnifying glass at one corner of a 1 inch square ransmitter during assembly.

ting we follow suit this month by spotlighting the world's smallest mobile.

Your attention is thus directed to my scale-model 1957 Corvette shown in photo 3. This vehicle boasts 326 milliwatts of sheer band-blasting power with a trunk-mounted three-transistor transmitter and mating one-IC receiver. Fuel injection (for the rig) is achieved by small wires routed to a 9 volt battery under the body, and output is extracted from a jack concealed inside the trunk. This arrangement seemed vital to avoid disrupting natural body lines of this classic chariot. Incidentally, the rear-mounted antenna, incidentally, serves is for more than mere show. It can also be quick-connected to the rig for in-shack demonstrations.

Our 'vette rig is fully self-contained and works 30 meters. However, it has yet to set any QRP records. That situation will surely be rectified when I have more time to use it on the air.

The transmitter is the "modified Oner" shown during assembly in photo 2. The idea of mounting a QRP rig in a model car evolved when Brian, N4DKD, and I built some 624 kits and challenged each other to dream up unusual enclosures. Maybe our 'vette rig will inspire others to be similarly creative. In fact, let's make it an informal contest. Send us your pictures of low-power rigs in unique enclosures, we will include them in the next QRP column and give you full credit, and even add a surprise award for the best design!

624 Kits

Many of our readers are probably asking for more information on the previously mentioned 624 Kits, so here is the story in a nutshell.

Pat Bunn, N4LTA, is presently making an impressive line of easy-to-assemble transmitters, receivers, keyers, and other accessories he calls "624 Kits." The kits are economically priced and all the 624 rigs N4DKD and I have built and tried have worked like a champ. The kits are improved versions of circuits featured in past *CQ* and *QST* articles and proven by numerous amateurs around the country. They are supplied complete with predrilled circuit boards and parts plus very good instructions.

One of the 624 transmitter kits is shown as received, before unpacking, in photo 4 and after assembly in photo 5 to give you an idea of the homebrewing concept. The time difference between these two pictures (that is, removing all the goodies from the bag, following the instructions, and building the rig) was only an hour. The little transmitter pumps out 2 watts on 40 meters, and the first contact while using it (15 minutes after assembly) was Canada with a 569 report. I have yet to mount the transmitter in a cabinet, hoping to convert it for 30 meters and add a mating 624 Kit receiver (which I have yet to try). I have been thinking of getting an extra ashtray for my car from a local salvage yard and mounting the full QRP rig in it for mobiling. Now that would be going in style!

Just looking through the 624 Kits catalog (available by sending a large business-size SASE with two stamps to 624 Kits, 171 Spring Lake Drive, Spartanburg, SC 29302) generates an irresistible urge

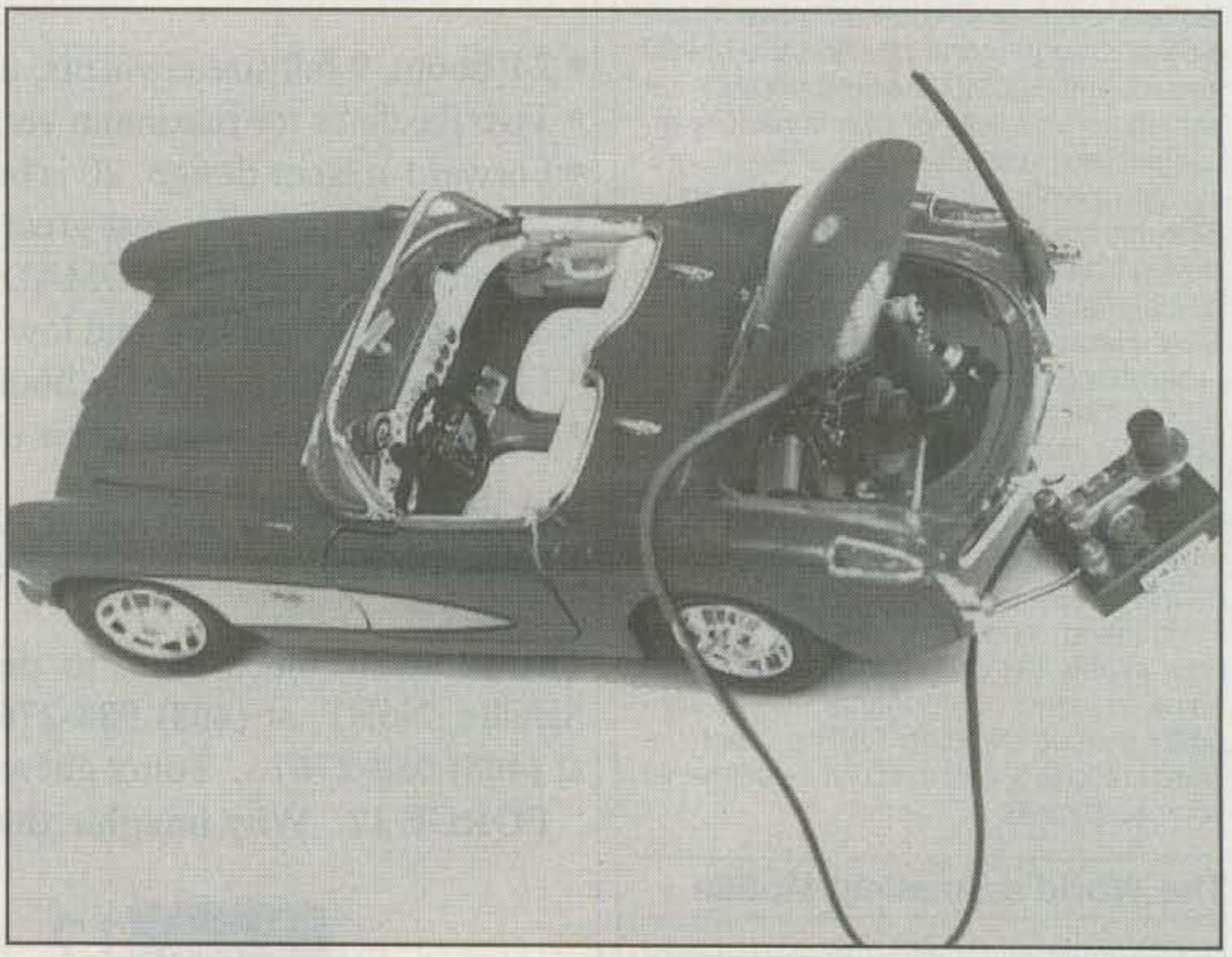

Photo 3– The K4TWJ " 'vette rig." Transceiver in trunk pumps out 326 mw on 30 meters. Trunk lid closes to conceal rig when not in use.

Say You Saw It In CQ

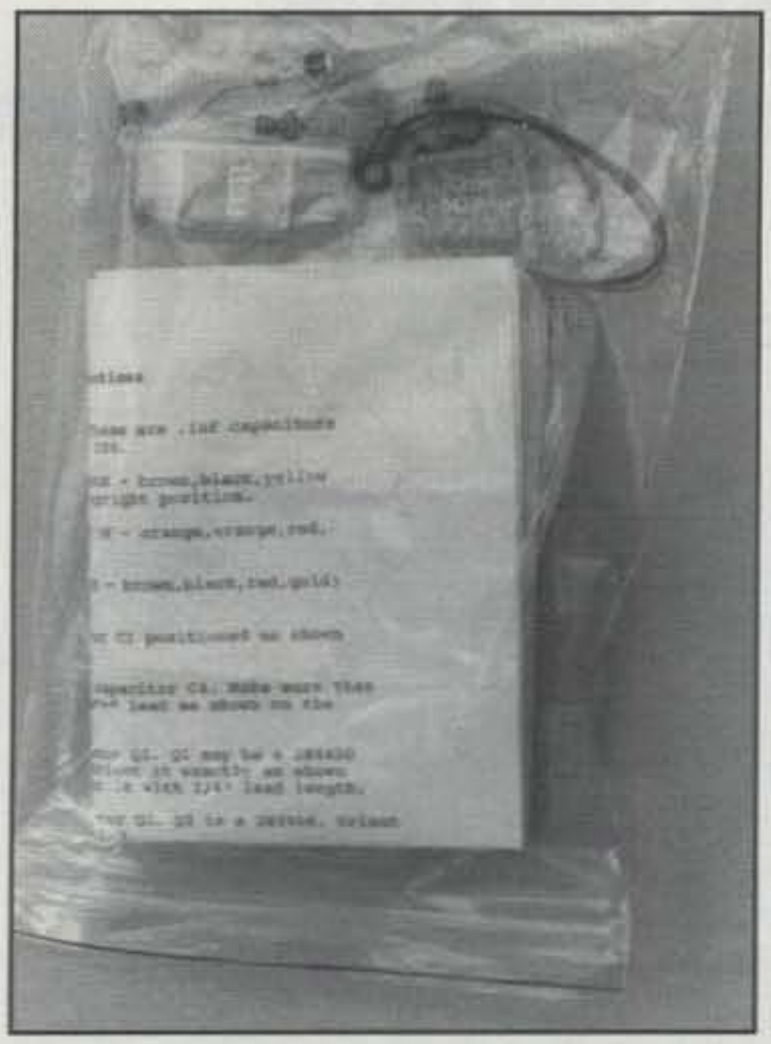

Photo 4– Universal transmitter as received from 624 Kits. All components plus instructions are enclosed in a ziplock bag—one-stop shopping at itsbest!

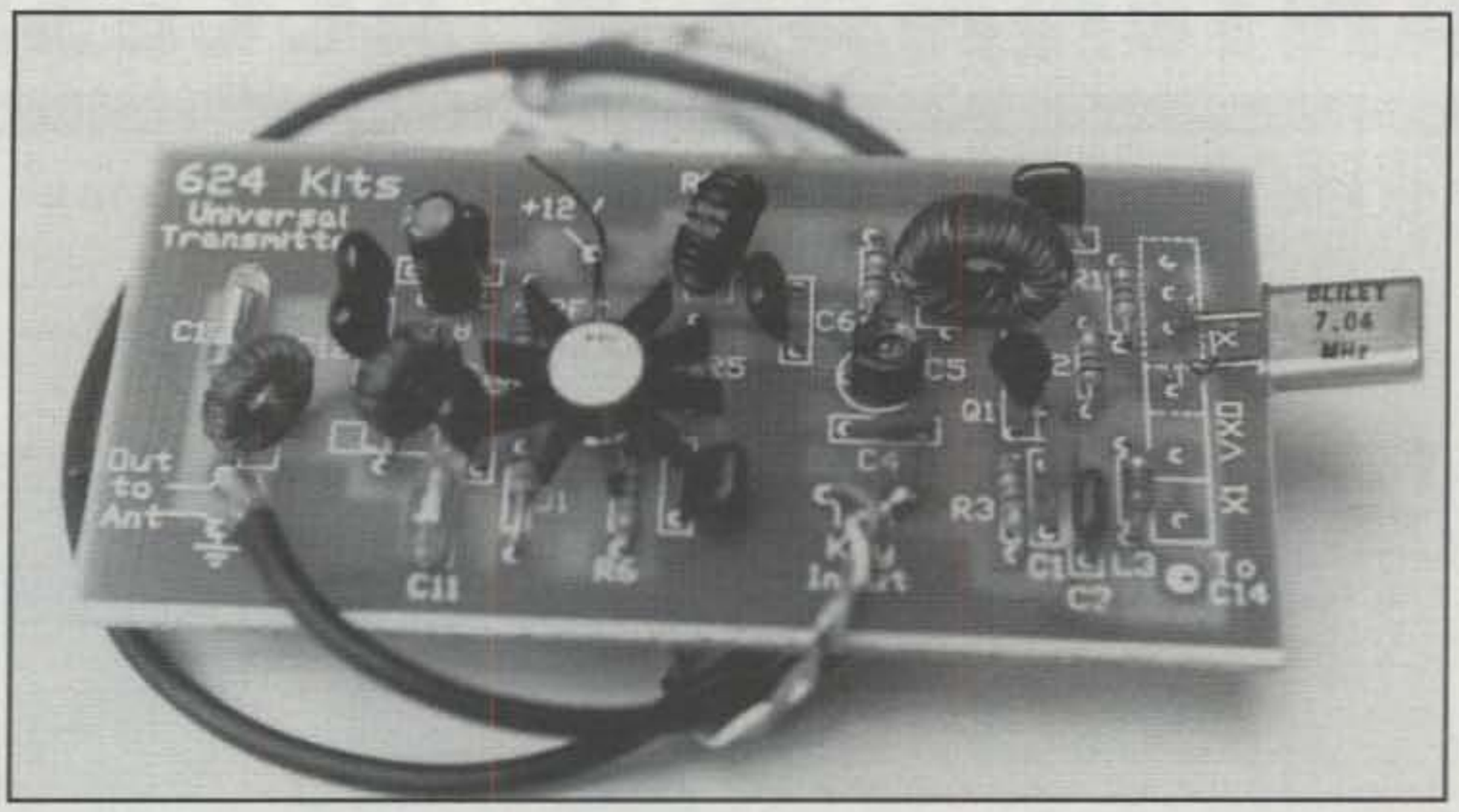

Photo 5– Assembled version of the 624 Kits universal transmitter. Rig worked perfectly right from the start.

to build some QRP rigs just for fun. There is a neophyte receiver, CMOS iambic keyer, a couple of transceivers priced under $50, a QRP AM transmitter, numerous small components, and much more in the catalog. N4LTA is truly doing a superb job of promoting QRP!

Conclusion

That winds down this month's column, and we trust it rekindled your enthusiasm for working QRP (or reminded you to respect QRP frequencies when using higher power). If you are ready to expand your QRP horizons, incidentally, check out my recently published book *How To Get Started in QRP* available from amateur radio dealers nationwide or from NARA (1-800-GOT-2-HAM).

Another traditional "Christmas Gifts" column is planned for next month, and we have lined up a variety of exciting items to fit any budget. Meanwhile, we look forward to QSOing you on 30 meters with QRP in the near future. Also, please remember to include an SASE and be patient for replies when writing to me. Good QRP DXing! 73, Dave, K4TWJ

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A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

BY KARL T. THURBER, JR., W8FX

New Antenna Stuff '93—Part VI

This month we conclude our series "New Antenna Stuff '93." Next month we will move on to a new topic, so let's wind up this series!

TIC Ringrotors. In the July 1990 "Antennas and Accessories" column we discussed the TIC Ring™ multi-rotating "Ringrotors." These heavy-duty devices let you rotate individual or multiple directional antennas, including large phased arrays, at any mounting location on your tower, not just at the top. As the ads say, the TIC Ringrotors are for "on-the-tower positioning" using "around-the-tower rotation."

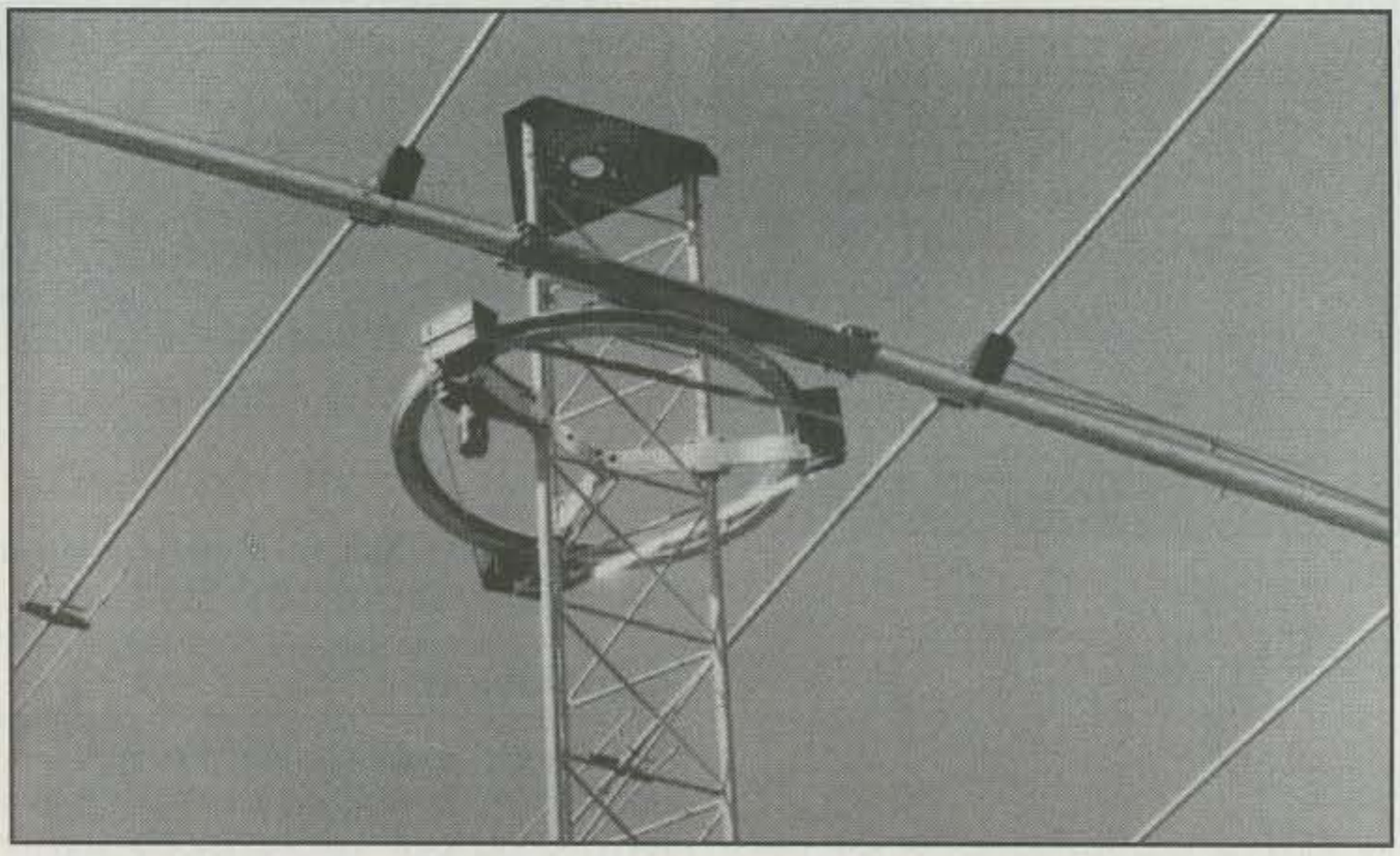
For several years TIC General has offered the large Model 1032 Ringrotor, which probably offers greater strength and load-handling capacity than any conventional rotor. The 1032 accommodates a maximum tower face width of 28 inches and a maximum leg diameter of 1½ inches. An antenna boom of from 2 to 3½ inches can be accommodated; other boom diameters can be handled using optional brackets. The 1032, which assembles around the tower, features rugged steel ring and gear assembly construction, a heavy-duty 24 volt worm-gear motor, worm-gear braking, hot-dip galvanizing, and antenna rotation through 360 degrees. The Model 1032 is $998 plus shipping and handling.

Todd Anderson, TIC General's sales manager, told me about the new Model 1022, designed specifically for amateur radio use. The 1022, a downsized 1032, is comparable to it, with overall performance estimated by the manufacturer at 85 percent of the 1032's load-handling capability. The 1022 fits towers having a maximum face width of 18½ inches and, like its big brother, mounts on stationary towers, wooden or metal poles, and crank-ups.

The smaller unit can be mounted at any safe location on your tower and can rotate the mast at the top of the tower, thereby eliminating the need for a conventional rotor. Up to three motors can be used for additional rotating and braking power; a second motor is recommended for antennas with 15 or greater sq. ft. of wind loading. The 1022 is $649 with controller. Optional equipment is comparable to that offered for the 1032 and includes a pole mount, crank-up tower mount, and truss assembly.

Initially, a digital control system was used to control the TIC Rings. Now, however, the digital box has been replaced with the new Model 2001 analog control box for both size Ringrotors. The new controller has analog metered north-center/south-stop readout, preset control, and potentiometer feedback. Overall accuracy is ±5 percent.

Contact TIC General, Inc., 302 E. Third St., P.O. Box 1, Thief River Falls MN 56701; phone 1-800-TIC-RING (1-800-842-7464).



TIC General long has offered the Model 1032 Ringrotor, which accommodates a maximum tower face width of 28 inches. The 1032, which assembles around the tower, features rugged steel ring and gear assembly construction, a heavy-duty 24 volt worm-gear motor, worm-gear braking, hot-dip galvanizing, and antenna rotation through 360 degrees. Various accessories are available. (Photo courtesy TIC General, Inc.)

D & D CLIFFDWELLER Antennas. Donna Nicholson, KA1TAW, and Dave Nicholson, KA1STT, have introduced the D & D CLIFFDWELLER™ antennas for restricted space operation on 10 and 15 meters. As half-wave, open-loop designs, the antennas are physically small but use no coils or traps. Several models are offered. These include an "economy model" for 10 meters built on a western cedar frame; economy models for 10 and 15 meters; and a "deluxe model" for 10 and 15 meters. The latter comes with precut tubing, all stainless steel hardware, and a fiberglass frame with predrilled holes. All loop elements are a "full" half wavelength.

The CLIFFDWELLERS feature painted copper elements, soldered joints, color-coded pieces, linseed oil-sealed western cedar wood (economy model), military-grade extruded fiberglass frame (deluxe model), a hairpin match to 52 ohm feedline, broadband frequency response, light weight, and compact structure. The antennas range from $89 to $289, depending on model, plus $20 shipping via UPS.

For more information, contact D & D CLIFFDWELLER Antennas and Tower Components, P.O. Box 5114, Dover, NH 03820.

FLYTECRAFT Antennas. Recently, Steve Flyte, K7SF, entered the antenna construction business with several monoband HF vertical and wideband VHF/UHF antennas. Steve offers the FLYTECRAFT™ Model SFX Monoband HF Vertical Antennas, notable for their small physical size, averaging about 9 feet in height. An internal helix gives full quarter-wave electrical length, and shortened "RADIALCOIL"™ radials reportedly allow use almost anywhere, whether coiled or stretched out. Separate models cover the 40, 30, 20, 15, and 10 meter bands. The antennas are rated for 500 watts, boast SWR or less than 1.5:1

The Model 1022 Ringrotor, a downsized 1032, is comparable to it, with overall performance estimated by the manufacturer at 85 percent of the 1032's load-handling capability. The 1022 fits towers having a maximum face width of 18½ inches and, like its big brother, mounts on stationary towers, wooden or metal poles, and crank-ups. The system is $649 with analog controller. (Photo courtesy TIC General, Inc.)

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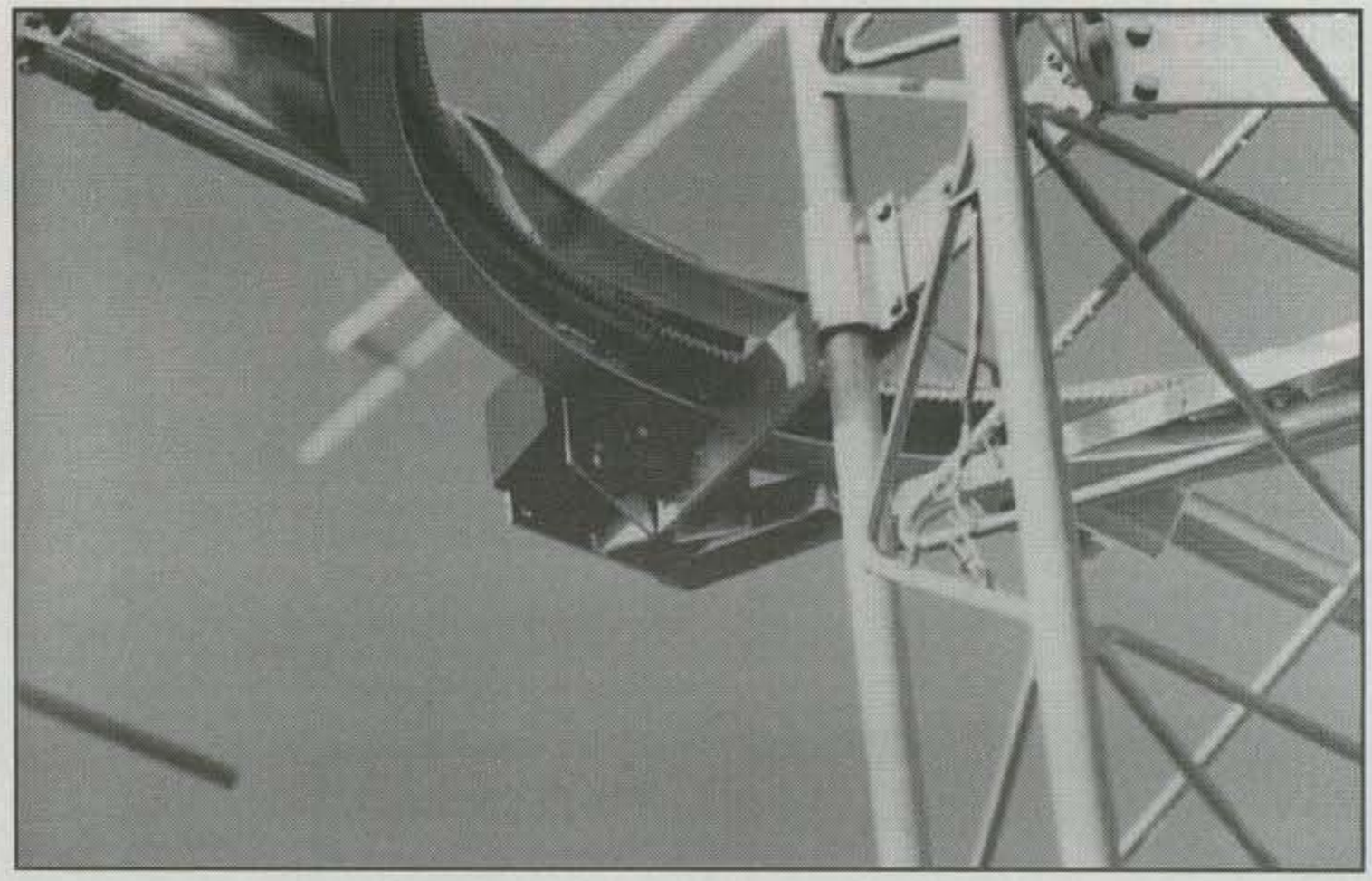

Here's an up-close photo of the Model 1032 Ringrotor. The unit is designed to mount and turn large antenna arrays; arrays having wind loads greater than 20 sq. ft. can be turned by using two motors. The new Model 1022, a downsized 1032, is comparable to it, with overall performance estimated by the manufacturer at 85 percent of the 1032's load-handling capability. (Photo courtesy TIC General, Inc.)

across most bands, and feature instant setup and teardown. A short whip at the top of the antennas is used to tune for minimum SWR. The SFX verticals are priced from $89.95 to $99.95, depending on band.

Also offered is the Model CFN Wideband VHF/UHF Antenna. Essentially a Discone for scanner use, it offers compact wideband receive performance from 50 through 1300 MHz. It also provides transmit capability (200 watts maximum) from 144 MHz to 1300 MHz, which includes the 144, 220, 450, 900, and 1200 MHz amateur bands. The antenna boasts low-angle radiation and claims a relatively flat SWR of less than 1.7:1 across most of its operating range. The antenna features easy, simple assembly, a gray plastic styrene "radome," light steel elements, aluminum brackets, and plated hardware. The CFN is $119.95.

For more info, contact FLYTECRAFT, P.O. Box 3141, Simi Valley, CA 93093; phone 1-805-583-8173.

8Radio Products Accessory Goodies. A relative newcomer to the ranks of antenna and accessory suppliers is 8Radio Products, operated by Dan Patterson, NX8R. In his catalog Dan offers an intriguing variety of "custom" towers and unique accessories. Many offerings are variations of products you may have encountered before, but some are not.

You may have seen roof-mount tripods or "quad pods" before, but you may not have seen many four-legged rooftop towers. The 8Radio towers offer excellent strength, while providing an economical means of raising an antenna to a reasonable height when other methods aren't practical. For example, some localities have restrictive ordinances that apply only to *ground-mounted* towers and not to roof-mounted types. Also, in some cases you may not be able to locate a tower in your yard due to space limitations or aesthetic reasons. Two roof-mount models are available costing $325 (6 ft.) and $375 (10 ft.); both include rotor plates.

Another interesting and unique product is a ground rod driver, one which can turn a usually unpleasant task into a tolerable one. The GRD-1, at $27.50, has a heavy steel plug welded inside its tubular body, placed off-center to create a 6 inch deep opening at one end and a 24 inch deep opening at the other. The beauty of the GRD-1 is that the top of the ground rod is contained within the body of the driver, reducing the chance of missed hammer blows and skinned knuckles. Also, both hands control the weight of the driver instead of only one hand wielding a heavy hammer, creating less fatigue.

Other innovative accessories include a portable hinged tower base, tilt-over concrete footer-mounted tower base, steel bar anchor bolts, custom "rebar cages" for use as concrete tower footers, galvanized and plain steel tubing and pipe, mast extensions for Ringo II™ type antennas with droop-down ground planes, and more products still under development.

For a free catalog, contact 8Radio Products, 7785 Mentor Ave., Unit #8, Mentor, OH 44060 (216-946-6889).

Reynolds Matching Transformers. In previous columns we have mentioned firms that offer matching transformers and connector hardware to take advantage of low-loss cable television (CATV) 75 ohm hardline, which often is available quite reasonably.

As most readers know, the 75 ohm cable impedance can cause SWR matching problems when used in 52 ohm antenna circuits, the cable connectors are expensive and can be difficult to install, and hardline in long runs tends to contract and expand with temperature changes. Tony Reynolds, KB8JVH, has addressed these problems by combining a special connector with a quarter-wave section of transmission line of the appropriate impedance to match the two dissimilar line impedances, 50 and 75 ohms. All transformers use high-quality Type N connectors mated to the 50 ohm end. The transformers allow several

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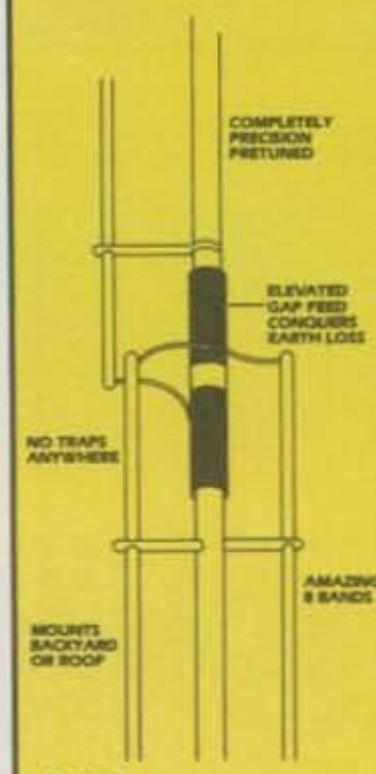

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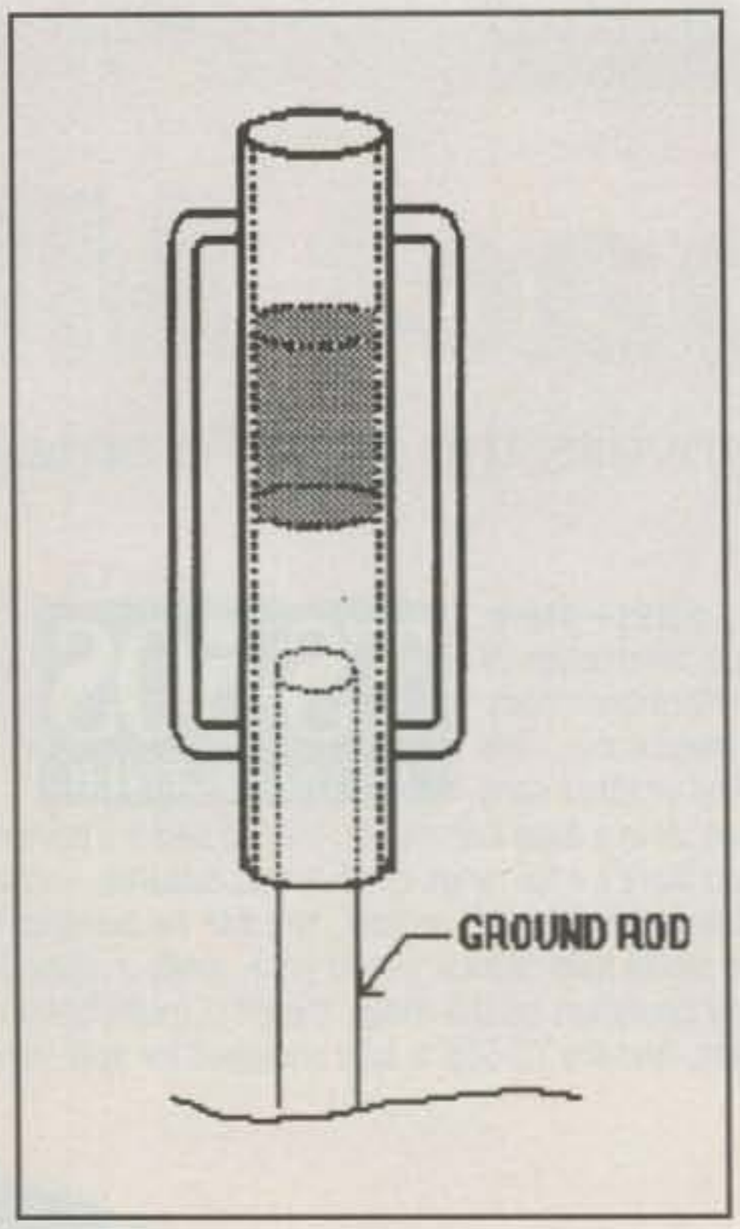

Fig. 1– The GRD-1 ground rod driver has a heavy steel plug welded inside its tubular body, placed off-center to create a 6 inch deep opening at one end and a 24 inch deep opening at the other. When ready to drive a ground rod, you place the rod upright on the ground and slip the GRD-1 over it, deep end down. You then grab the handles of the driver and ram the rod into the ground until the end of the driver is at ground level. Next turn the unit upside down and finish driving the rod. The 9 lb., 36 inch long unit is from 8Radio Products (see text for details).

inches of hardline to be inserted into the transformer to eliminate the problem of shrinkage caused by temperature changes.

Custom-built transformer sets are available for 144–148 MHz, 222–225 MHz, and 420–450 MHz. Each set boasts a claimed typical SWR of 1.15:1 over a 3–5 MHz range, depending on band. Reynolds asks that when ordering you send a 4 to 6 inch piece of your hardline, since there are slight variations in size between manufacturers. The units are $35 per set plus $5 shipping per pair.

For more information and a spec sheet, contact Tony Reynolds, KB8JVH, at Reynolds Electronics, 72 S. 23rd St., Newark, OH 43055 (614-344-5357 from 7–10 PM EST).

Dunestar Systems Filters. Ron Crouse, AA7EA, has introduced two transceiver RF bandpass filters for applications such as close-proximity multiple-transmitter contesting, interference to/from other nearby amateur stations on adjacent bands, and TVI suppression. The filters are three-pole, Butterworth types; stable, dipped mica capacitors and toroidal coils are used for tuned circuits. The Dunestar filters are designed to be used with 100 watt output class transceivers; typical insertion loss is 0.5 dB and rejection is 40 dB typical. The units are 50 ohms in and out and have SO-239 connectors.

The 500 Series, at $150 plus $4 shipping, is a five-band filter for 80, 40, 20, 15, and 10 meters; custom frequencies also are available. The filter is placed in the line between the transceiver and antenna or amplifier, with bandswitching being accomplished through internal double-pole, double-throw (DPDT) relays. Activation is by negative circuit closure to ground and can be tracked with your transceiver bandswitching function using an interface, or combined with your antenna remote switching (switching examples are included in the instructions). A failsafe feature is provided so that loss of DC voltage at any time causes a straight-through connection between the transceiver and antenna or amplifier it is feeding. The unit requires 9–12 VDC.

The 100 Series filters are single-band units that can be obtained for 160, 80, 40, 20, 15, or 10 meters, priced at $32.50. Custom band coverage filters are available at $41.50.

For more information, contact Dunestar Systems, P.O. Box 37, St. Helens, OR 97051 (503-397-2918).

R&D Systems Spectrum Analyzer. The AS-100 Spectrum Analyzer is a converter that transforms any oscilloscope into a versatile spectrum analyzer. The ordinary 'scope displays signal amplitude as a function of time, but doesn't give much information with regard to frequency. With the AS-100 connected to the 'scope, the presentation is converted to a frequency domain display that exhibits a wide dynamic range. Observing the display lets you see all frequencies present and lets you note their amplitude.

The AS-100 covers 2.8–108 MHz and has a dynamic range of 60 dB. It is furnished in an RF-protected metal housing with BNC connectors and is priced at $179; a second model, the AS-1750, works over the range of 850 to 1750 MHz and is $259. More information and a flyer are available from R&D Engineering Systems, 502 Canal St., Folsom, CA 95630 (916-985-2555).

ACE Communications Catalog. Although best known for its several lines of hand-held, mobile, and base-station scanners and other receivers, ACE Communications also issues a monthly catalog that increasingly includes various accessories of interest to readers of this column—especially scanner buffs.

Some interesting goodies in a recent catalog include the AOR GW-2 GaAs FET wideband RF preamplifier for receivers, frequency counters, and spectrum analyzers. Also offered is the AOR MPIF multi-purpose interference filter for selective filtering of several bands (low-band TV, FM broadcast, 150 MHz paging, and cellular transmissions above 870 MHz) that tend to interfere with "clean" scanner reception. ACE also offers the full-function, SV150 SpectraVu spectrum analyzer adapter that covers 0–1300 MHz, to be connected between the receiver and any oscilloscope. Other ACE accessories include several wideband base station directional receiving antennas which cover 25–1300 MHz; computer control software for scanning receivers; and personal computer equipment.

For a free catalog, contact ACE Communications, 6975 Hillsdale Ct., Indianapolis, IN 46250 (1-800-445-7717).

Radioware Catalog. A free, 54-page, illustrated catalog of antennas and RF accessories for amateur, SWL, and scanner hobbyists is offered by Radioware Corp. Among Radio-

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ALINCO DJ-F1T 2m Mini HT (right) • 130-174MHz rx, mod. for 118-136MHz rx and MARS/CAP tx. 8 scan modes, autodialer, back lit keypad, 40 memories, call channel. CTCSS, DTMF encode and DSQ paging. 2.5W; 5W opt. 4 5/16 "h x 2⅛ "w x 1½ "d, 14 oz..... ☎
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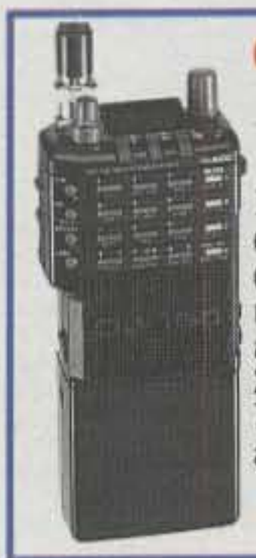

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For a catalog, contact Radioware Corporation, 87 Belmont St., N. Andover, MA 01845; phone 1-800-950-WARE (1-800-950-9273).

W6AAQ DK3 Antenna Update. A letter from longtime HF mobile antenna specialist Don Johnson, W6AAQ, provided some additional and updated information on his popular DK3 Continuous Coverage HF Mobile Antenna. In several previous columns we briefly described the automatic, no-relays DK3 design that can be used to cover 10, 20, 40, and 75 meters. The antenna resonates without taps or roller coils and tunes continuously to any frequency from 3.5–30 MHz. No jumpers, open or shorted turns, or "other degrading garbage" [Don's words] are used, yet an essentially flat 1:1 SWR is claimed on all frequencies within the design range. One of the best features of the full-coverage DK3 design is that it resonates at any frequency from 3.5 to 30 MHz without the driver or passenger having to leave his/her seat.

Hopefully, Don still has some copies left of his 17-page DK3 design manuscript that we mentioned in an earlier column, should you want to homebrew a DK3. The manuscripts are $5 postpaid from Don Johnson, W6AAQ, 26659 Capay St., Box 595, Esparto, CA 95627-0595 (916-787-3905). We should also note that Don is the author of *40 + 5 Years of HF Mobileering*. This is a very interesting historical scrapbook and technical compendium published by his DK Publishing and Worldradio Books, an earlier edition of which we reviewed previously in this column.

We should also make clear that the DK3 antenna we described in the June column, offered by Douglas RF Devices (P.O. Box 246925, Sacramento, CA 95824-6925; phone 916-688-5647) is a ready-made version of the W6AAQ-designed DK3, which Douglas has permission to build and distribute for those who prefer not to homebrew the antenna. The Douglas-manufactured DK3 features one-step assembly: just mount the whip on the base and it is ready for installation and use without tuning, tweaking, or tip pruning. A 1:1 SWR is claimed on all frequencies within the design range. Remotely and automatically tuned versions are available.

Signal Cube Update. In last May's column we profiled the new, precision Nye Engineering digital field strength meter (FSM), the FS 73 Signal Cube ($169). As we noted, the Nye unit is untuned and broadbanded, covers from 0.1 to 450 MHz, and has a large digital display to indicate RF amplitude. The 9 volt battery-operated unit is unique among FSMs in that it can be used not only for relative readings but also for absolute readings.

Recently, proprietor Dudley Nye, AB4OK, pointed out some FS 73 features we did not mention that he considers to be important factors in choosing a precision FSM. The included adjustable dipole antenna eliminates the need for a counterpoise; conventional "single

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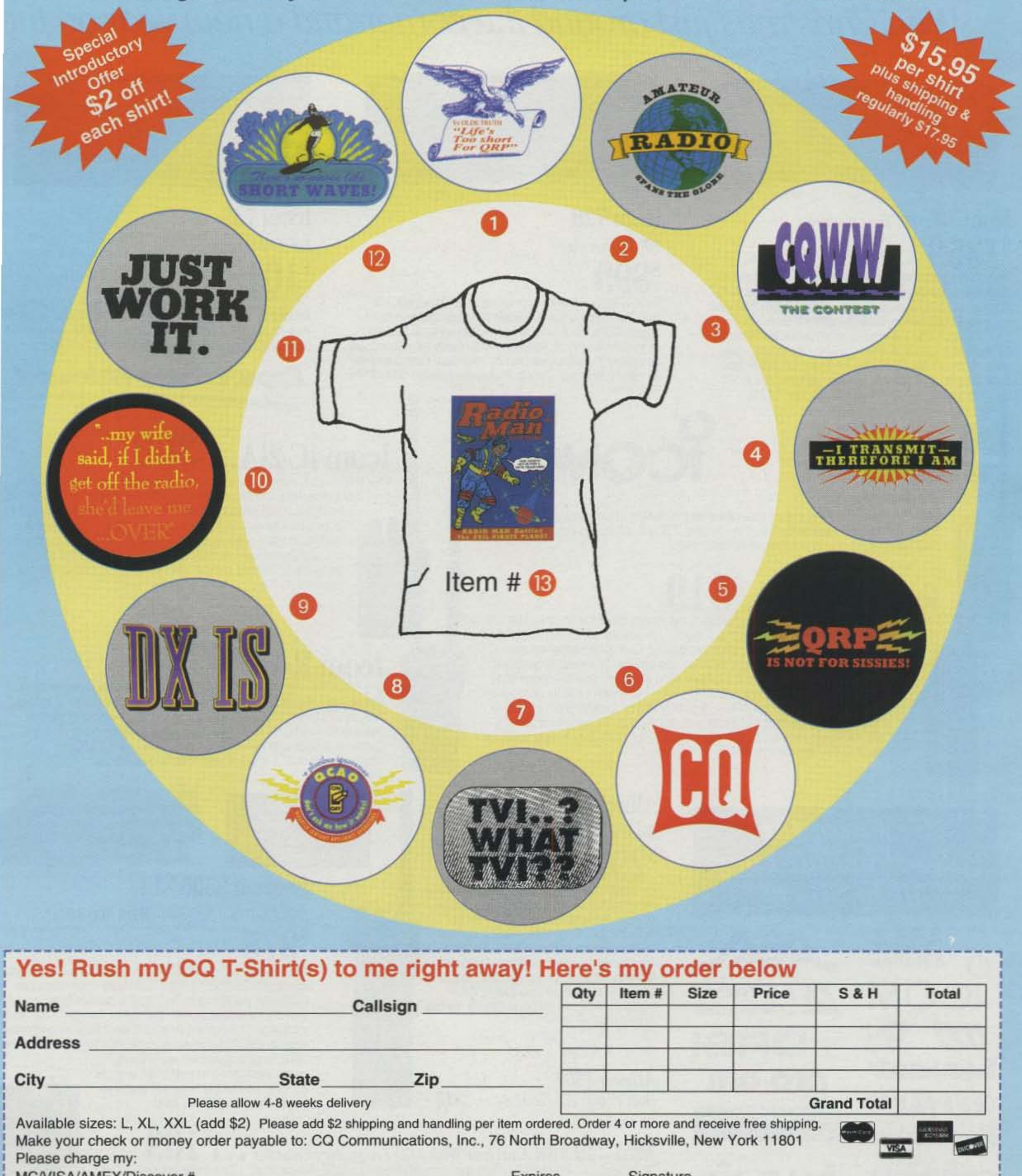

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The IC-728 offers high performance features not found in any radio in its class. The triple conversion DDS receiver provides excellent receiver performance while Pass Band Tuning allows you to narrow the pass band and eliminate interfering signals, features you would normally find on higher priced transceivers! 26 memories, band stacking registers, and a speech compressor make this an excellent choice for mobile or base operation. 3 3/4 x 9 1/2 x 9 1/2, 10 lbs.

Icom 735

HF Transceiver

$1019

The IC-735 has traveled to DX locations around the world! It has gained a reputation for reliable rugged performance. It includes 100 watts, general coverage receiver, 12 memories, Pass Band Tuning, notch filter, and semi or full break-in CW. All in a small package: 3 3/4 x 9 1/2 x 9 1/2, 12 lbs.

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Icom 2GAT

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2M HT. The IC-2GAT is the only handheld on the market which gives you 7 watt capability. It also includes 20 memories, CTCSS encode, call channel, multiple scan modes, and a rugged durable design.

Icom W21AT... $519

The W21AT includes innovative features not found on any other handhelds. The V/V and U/U feature allows you to receive 2 signals simultaneously on the same band as well as normal cross-band repeat and duplex. In the innovative whisper-mode, the W21AT transmits constantly on one band while receiving constantly on the other. A microphone in the battery pack gives you true telephone-style full duplex for the first time in a handheld! Your most often used functions are automatically assigned to the Ai key in priority of use- another Icom exclusive! All of this plus "standard" dual-bander features such as 70 memory channels, 4 DTMF memories, numerous scanning modes and much, much more combine to make this the ultimate choice in a dual band HT.

Icom IC-2iA... $309

This shirt-pocket sized radio eliminates the myriad of buttons found on most other HTs and allows the simplest operation of any handheld. Sophisticated features such as 10 memories, scan modes, 24 hour clock, advanced power saving functions, tone squelch, and much more are included. Up to 5 W output is available in this unit that measures only 2.3" x 3.6" x 1.2". Leave all those complicated buttons behind- step up to the simple-to-use but powerful IC-2iA!

Icom R-1... $479

The R-1 is the ultimate hand-held communications receiver! It covers 100 kHz to 1300 MHz continuously with AM, FM and wide FM modes. Features include: 100 memory channels, several scanning modes, sleep timer, low battery indicator, and several battery power options. Comes complete with wall charger, flexible antenna and belt clip. Measures only 1.9" x 4" x 1.4" and weighs only 9.9 oz.

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Alinco DJ-560T

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The DJ-560T combines superb performance and features with an incredibly low price in a dual band HT. This unit allows simultaneous reception of both bands for full duplex operation. 40 normal memories and a call channel allow full storage of all local repeaters. Three scanning modes let you easily find repeaters when traveling. All of this combined with code squelch, DSQ, 3 paging functions, an auto-dialer, 5 W output with 12 VDC or optional 12 V battery and much more make this your best choice in a dual band HT.

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Alinco 130T

High Power 2m FM Mobile... ***$319***

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Without a doubt, this is the premier scanner on the market today. It features coverage from 25 MHz to 1.3 GHz in 500 channels. 20 banks store these channels and your 20 most important channels can be designated as priority channels. The exclusive dot matrix-alpha numeric illuminated display allows you to program in the name of the station (Dallas Police for example) on the screen for easy identification of each channel. All of the great features of the 890 XLT are also included such as a VFO knob, weather search, turbo scan, weather alert, selectable scan delay, reception counter and step select. If you want the best, get an 8500 XLT today!

MFJ-249 *SWR Analyzer With LCD Frequency Counter* ... $169

MFJ's newest, most versatile SWR Analyzer covers more frequencies than any MFJ Analyzer before: 1.8 to 170 MHz continuously. It has a built in 10-digit frequency counter that makes reading SWR in the sun easy. You get three instruments in one... a low distortion RF signal generator, a high accuracy 170 MHz frequency counter, and an SWR Analyzer. Measures 4" x 2 1/2" x 6 3/4". **FREE AC ADAPTER**

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Icom IC 707

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For someone just starting out or wanting a simple to use radio, the new 707 is a great choice. It has easy to use push-button functions, a large LCD display that won't wash out, an easy to hear front-mounted speaker, rugged Icom quality and a price that will fit your budget. Of course it has many of the features found in more expensive radios such as 32 memory channels, dual VFO, RIT, a general-coverage receiver and much more. In short, the 707 is the easiest introduction ever to Icom performance and quality.
Also Available: Icom IC-77 with similar operating features, but alphanumeric display, channel tuning and cloning capability. Call for more details. Priced at only $799.

Icom 765

HF Transceiver

$2399

The DX'ers choice! The IC-765 is a full featured high quality HF transceiver without the high price of the top of the line models. It features a low phase noise DDS receiver with a 100 watt transmitter. The automatic antenna tuner tunes from 160M to 10M and even tunes on receive! It includes dual VFO's, Band Stacking Registers, 99 memories, electronic keyer, IF shift, notch, CW narrow filter, and full break in CW. High performance in a mid price range. 5 7/8" x 16 3/4" x 16 1/4", 39 lbs.

Icom 781

HF Transceiver

$5699

The IC-781 is the ultimate amateur HF transceiver. It includes a 5-inch CRT spectrum scope which also displays VFO frequencies, menu screens, memory contents, and packet/RTTY data. It is all mode from 160 to 10M with a 150 watt transmitter. The receiver is a quadruple conversion DDS (Direct Digital Synthesizer) general coverage receiver from 100 kHz to 30 MHz. This is the ultimate radio for contesting, DX'ing, or for casual QSO's. 5 7/8" x 16 3/4" x 16 1/4", 51 lbs.

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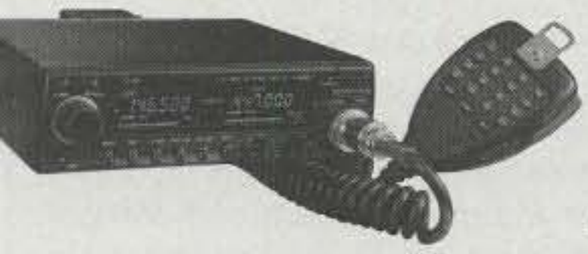
Icom 3230H Dual-Band Remoteable Mobile with FREE Hustler UGM Dual-Band Mag Mount Antenna

List Price For Both... ~~$821~~

Tucker BUNDLE PRICE for Both... **$675**

The 3230H measures only 5.5" x 1.6" x 6.5" so it will fit anywhere in any vehicle. Great features like a large dual-band readout with independent control one touch action switches, 30 memory channels and much, much more make this a great unit to take mobile. The UGM antenna will match the 3230H on both bands. 45 W.



Icom 2410H Dual-Band Remoteable With FREE Hustler UGM Dual-Band Mag Mount Antenna

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Tucker BUNDLE PRICE for Both... **$729**

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antenna" type FSMs effectively use the person holding the unit as the counterpoise. Also, consistent and repeatable readings (especially important for making signal comparisons) can be obtained, since it is not necessary for the observer to hold or be in close proximity to the meter.

The FS 73 is from Nye Engineering Co., Inc., 4020 Galt Ocean Dr., Suite 606, Fort Lauderdale, FL 33308 (305-566-3997).

New Software '93

Ocean View FCC CD-ROM. Jim Conrad, N4WFP, owner of Ocean View Communications, offers commercial and hobby versions of the Federal Communications Commission (FCC) data on CD-ROM. His objective in offering the CD-ROMs is to make available extensive FCC data that's not too expensive for the average amateur, scanner enthusiast, or SWL to consider, or too poor in quality for the professional user to justify the cost. The commercial version includes all data that is part of the so-called "FCC Master Tapes," while the hobby version contains only selected Public Safety, Aviation/Marine, and Private Radio data.

The hobby disks are available in regional versions (east, center, west) and are $159.95 each. There also are two hobby "option disks" that separately cover the 470–512 MHz and 800–900 MHz databases. The commercial disk set ($1599.95) includes all of the regional and option hobby disks, plus broadcast, common carrier, experimental, and microwave data.

For more information, contact Ocean View Communications, P.O. Box 15074, Norfolk, VA 23511 (804-587-8251).

QSO Simulator and CW Trainer Update. In the June column we profiled QSO Simulator and CW Trainer, both offered by Gote Lofstedt, a Swedish SWL (SM5-7609). As we noted, the main characteristic of QSO Simulator is its universe of 200 "artificial hams" who are running QSOs and contests with each other and waiting for contacts with the outside world. You can answer a station or make your own CQ calls by typing on the keyboard, tapping out code with the keyboard SHIFT key, or using a straight key or keyer connected to the serial port. An on-screen map shows the location of the computer-based stations.

Gote recently sent us a new version of QSO Simulator that adds new features. These include the ability to use a straight key and a paddle (the latter allowing the program to serve as a keyer), and user choice of which serial port (COM 1-4) to use. Also, CW Trainer, which we mentioned in the same column, has been split into two distinct programs, CW Receiving (CWR) and CW Sending (CWS), mainly to make the menus less crowded. These programs are offered separately or together.

Each program is available on 3.5 or 5.25 inch diskettes. The pricing scheme has changed since we mentioned the programs last, so contact the author for current pricing: Gote Lofstedt at Sim-Data Linko, Djurgardsgatan 71, 6tr, S-582 29 Linkoping, Sweden.

A Simulator From the Past. Before leaving Gote Lofstedt's QSO Simulator, we should mention that several years ago Advanced Electronic Applications (AEA) brought out the "Dr. DX Contest Simulator" for the Commodore 64 and C-128 computers. Somewhat similar in function to QSO Simulator for the IBM PC, Dr. DX was a plug-in ROM cartridge designed to improve CW and contesting skills. As you tuned around the selected band, you heard QSOs in realistic band conditions, including QRM and QRN.

Dr. DX let you exchange callsigns, signal reports, and contest information, and it kept track of your score, the time, and QSOs per hour. Originally offered at $119.95, AEA has announced that the units are available again in limited quantities for $29.95 plus $5 shipping and handling. Check first to see if they're still available from AEA, Inc., P.O. Box C2160, Lynnwood, WA 98036-2160 (206-774-1722).

Initially a digital control system was used to control the TIC Rings. Now the digital box has been replaced with the new Model 2001 analog control box for both size Ringrotors. The new controller has analog metered north-center/south-stop readout, preset control, and potentiometer feedback. Overall accuracy is ±5 percent. (Photo courtesy TIC General, Inc.)

The Norton Utilities 7.0. The Norton Utilities (NU) long has been associated with data protection and emergency data recovery; we looked at Version 6 in November 1991. Norton 7.0 is a major update of the integrated utility collection that offers sophisticated tools for protecting data, enhancing PC performance, and conducting preventive disk maintenance. The Norton Utilities covers five major areas: disk repair and data recovery, data security, performance enhancement, disk tools, and hardware diagnostics.

We covered key features in the November 1991 column, so we won't repeat them here. The latest incarnation holds few surprises, but nevertheless offers some worthwhile updates and improved versions of its many well-established utilities including the Norton Disk Doctor, Advanced Disk Editor, NDOS (a flexible COMMAND.COM enhancement similar to JP Software's 4DOS, Version 4.02), File Fix, File Find, and others. There also are some excellent features new to this version, including a handy one-pass floppy disk duplicator, the ability to create an auto-loading emergency data recovery disk to recover crashed systems even when DOS has been damaged, and a comprehensive suite of in-depth hardware diagnostics.

Version 7.0 is tailored to work hand-in-glove with Microsoft's DOS 6.0 and large compressed hard drives. In fact, NU Version 7 not only leverages DOS 6.0 features, but also offers several advantages and features not available in DOS 6.0 as it comes out of the box. NU includes data recovery and optimization (defragmentation) of DOS 6.0 DoubleSpace, Stacker, and SuperStor compressed drives and support for drives up to two gigabytes in size. Thus, you now can safely defragment various compressed drives for optimum disk performance and speed, as well as recover and repair even very large compressed drives.

Version 7.0 supports the new DOS 6.0 memory manager and its compressed drive format, and the new Disk Doctor recovers and automatically repairs data from damaged compressed files and provides early detection of media defects to prevent data loss. The new included hardware diagnostics utility provides comprehensive hardware testing and system integrity assurance and helps identify faulty and unstable system hardware and components. The diagnostics can, of course, help prevent unexpected and intermittent failures or potential data loss, as well as offer a "helping hand" when your PC's chips go down.

All this protective power comes at a price—a rather steep $179, although it's available for considerably less at discount, and upgrades for previous NU users are very reasonably priced. And, while NU doesn't offer the diversity of features found in its main competitor, Central Point Software's PC Tools, since it's almost totally dedicated to disk maintenance. However, jack-of-all-trades products don't quite equal NU in terms of disk repair and data recovery capabilities. At the bottom line, NU's advanced technology probably safely repairs more types of common software and hardware

Say You Saw It In CQ

problems than any other utility package. For more information, contact Symantec Corporation, 10201 Torre Ave., Cupertino, CA 95014-2132 (1-800-441-7234).

New Books '93

Joe Carr Cookbook. Well, it's really not a culinary-type cookbook, but noted antenna authority and prolific author Joe Carr, K4IPV, has come up with a very comprehensive "cookbook of antenna recipes" for shortwave listeners (SWLs). We're talking about Joe Carr's *Receiving Antenna Handbook*.

Joe takes the approach that your receiver is only as good as your antenna. Unlike some SWL antenna books, this one isn't a warmed over collection of slightly adapted amateur radio antenna designs, nor is it a too-basic-to-be-useful "how to build a dipole" type book. Rather, in its 13 chapters Joe discusses the elements of antenna theory, trade-offs and compromises inherent in real-world antenna systems, construction techniques, safety considerations, grounding procedures, and lightning protection. Also covered are transmission lines, longwire antennas, Beverages, verticals, directional arrays, small loops, low-frequency antennas, and much more.

Space also is devoted to active antennas and other solutions for limited space antennas. Accessories, such as antenna tuners and preamplifiers, are covered in detail. Joe also includes information on how to use various RF test instruments suitable for SWL use, such as noise bridges and standing-wave-ratio (SWR) analyzers, used to determine various antenna operating and performance characteristics.

The Carr book lists for $19.95 plus $3 shipping and handling from HighText Publications, Inc., P.O. Box 1489, Solana Beach, CA 92075 (1-800-888-4741).

Short Bursts

A Friendly Reminder. When writing to your "Antennas and Accessories" editor, please include a SASE or IRCs for prompt reply, and write directly to our Alabama address rather than via *CQ*'s New York offices. Sending correspondence meant for us to Hicksville just means it has to be forwarded, delaying the response to you.

Note, too, that we have a new mailing address: 289 Poplar Drive, Millbrook, AL 36054. We haven't moved, but the Post Office, county Emergency Management (911) folks, and local building superintendent got together and decided that it would be great fun to renumber most of the addresses in the city and county so that their new "911 software" would work right by properly correlating telephone numbers, mailing addresses, and physical locations. Lots of work for all concerned.

Wrap-Up

That's all for this time, gang. Next time more "Antennas and Accessories" topics of current interest. See you then.

Overheard: The simpler something looks at first glance, the more problems it hides.

73, Karl, W8FX

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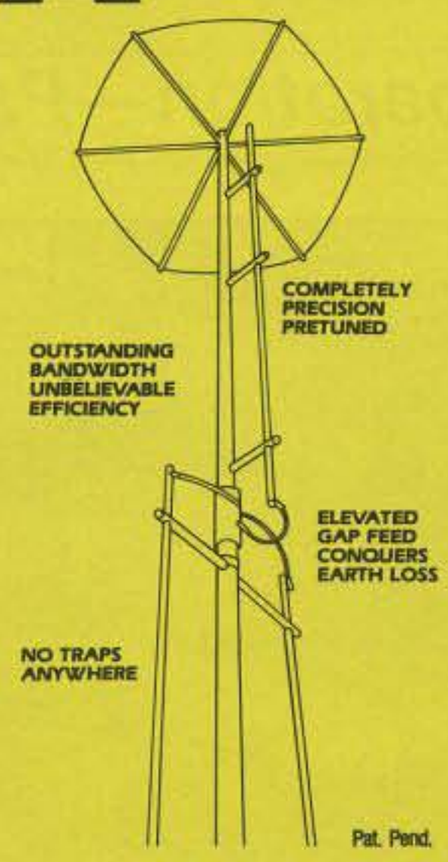

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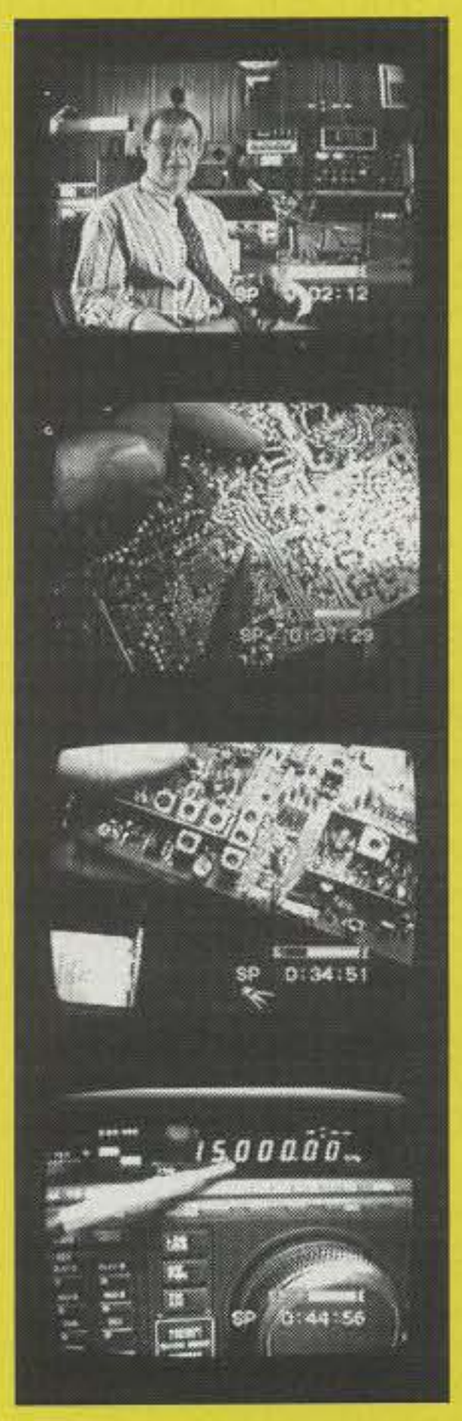

BILL'S BASICS

BY BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Code Operation—Part II

This month's column completes this two-part article, which is intended to improve the code operating practices of newer amateurs. Last month's article covered accuracy, bands and times, dah-to-dit relationships, filters, keys, listening, multiple identifications, Q signals, RST reports, same frequency usage, short CQ calls, and speed. Both parts of this article should be read at least twice to derive maximum benefit.

Time. It usually takes a long time before new amateurs fully realize the advantages related to using Universal Time Coordinated (UTC) instead of local time. However, UTC should be used to eliminate time and date confusion. Determine the time difference between UTC and your local time. The most common mistake related to the use of UTC is amateurs forget to shift to the next date when the UTC time passes 0000. Simply stated, if the local evening date is the 22nd, the UTC date is the 23rd. UTC is often referred to as Greenwich Mean Time (GMT) or Zulu/Z time, but UTC has been the correct term since 1979. I hope you will simplify your amateur operation by using UTC at all times.

Phillips Code. We use phonetic abbreviations to reduce the number of letters we send during code contacts. As an example, "HW R U?" means "How are you?" It is to your advantage to become familiar with this phonetic shorthand as quickly as possible, and to use it extensively. However, it is sensible to avoid such abbreviations when communicating with an amateur who does not seem to know them. If the other amateur does not use these abbreviations, she/he probably does not know them, and you should not use them in that contact.

Punctuation Marks. New amateurs tend to use the punctuation marks they learned when they acquired their license. There is nothing wrong with using punctuation marks, but most of us tend to avoid using them. If you have enough patience to send punctuation marks and you like to use them, do so.

QSL Cards. Most new amateurs like to get cards from the amateurs they contact. However, few of them purchase cards when they are getting started on the air. This hesitation to buy cards is partially due to the fact that they expect to change callsigns when they upgrade. It is a good idea to obtain a reasonable supply of QSL cards as soon as you are going to start operating. The lowest cost cards work as effectively as the most expensive ones in regard to obtaining cards from the amateurs you contact. The QSL cards you receive while using an initial callsign are accepted towards thousands of operating awards, no matter how many callsigns you acquire after you upgrade. Many experienced amateurs work the Novice code segments to give new operators code practice and to send QSL cards to them. If you want a card, say so during the contact. If your address is not listed in the current domestic (U.S.A.) *Callbook*, transmit your name (first and last) and mailing address (including zip) during the contact. Do not assume that every amateur has a current *Callbook*; ask the other operator if she/he needs your name and address.

Most experienced amateurs will not mind if you do not have a card to send to them; they know that a QSL is more important to a new operator. If you forget to request a card during the contact, it is acceptable to mail a request for a card; remember to include complete contact data and your address. If you want to learn a lot about QSL cards, including their selection and uses, you could obtain a copy of the *PSE QSL* book published by Tiare Publications. If you want information about this book, send an SASE to my California address.

Contact Data. Many amateurs like short contacts, but a lot of us like to chat, which is called ragchewing. If you answer a CQ call, you should be prepared to start a conversation after RST, name, and QTH data have been exchanged. The operator who sent the CQ call does not know how well the other amateur hears her/his signal. Consequently, this operator limits her/his first transmission to the RST report, QTH, and name. However, the amateur who answered the CQ call does know how her/his signal is being received. That amateur should initiate a conversation immediately after exchanging RST, QTH, and name data.

When you make a CQ call, you are not calling any specific amateur; it is simply a general call to all stations. However, when you answer a CQ call you are calling a specific amateur.

When initiating the conversation, it is good to keep it relatively short. Most operators just tell about their rig, antenna, and weather to start an on-the-air conversation. Subsequent transmissions may in-

Konrad Schmoll, VE3SCH, lives in Stoney Creek, Ontario, Canada. I know he is active on the air because I have enjoyed two nice code contacts with him. One of his first contacts was with Manfred Graef, DF1PJ, of Koblenz, Germany. That reply to his CQ call (general call to all stations) was very welcome, since the two men had been classmates, graduating in 1952. They now keep in touch with each other on the air.

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clude subjects such as age, job, non-amateur interests, family, operating interests, amateur experience, military experience, etc. Long conversations are usually more interesting than short contacts. However, you should keep contacts short when working a foreign (DX) amateur who is trying to contact as many amateurs as possible to supply them with cards. These DX operators usually just want to exchange RST, QTH, and name data. In some cases they just want to swap signal reports. Please do not drive DX amateurs off the Novice bands by making long transmissions. If a DX operator is willing to chat with you, she/he will make that fact obvious by starting a conversation with you. If the DX amateur answers your CQ call, she/he is probably willing to chat with you.

Practice. Many experienced operators work new amateurs to give them code practice which new operators may need to upgrade to higher class licenses. In such cases they are not interested in working the new amateur's computer; they want to work new amateurs to give them code practice which new operators may need to upgrade to higher class licenses. In such cases they are not interested in working the new amateur's computer; they want to work the amateur herself/himself. Computers do not need code practice, but many new amateurs do need it. If you are practicing code reception intending to pass a code test, it will help you if you copy what you receive on paper. It is true that you will gradually become accustomed to copying in your head, but you initially need the ability to write down (transcribe) code as you hear it.

Sung-Ki Lee, HL3IWD, of Chunan, South Korea, is a 32-year-old opthamologist, and his wife, HL3MJV, is a voilinist. His station includes Technic 45 and 55 transceivers, manufactured in South Korea, plus a Cushcraft R-7 antenna. Sung-Ki Lee hopes to work you on code.

HR Use. Amateurs tend to chat using a lot of abbreviations and shortcuts on the

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AP8A: 80-10 vertical
R7: 40-10 vertical
AV3 & AV5 verticals
D3W: 10, 12, & 17 meter dipole
D4: 7, 14, 21, 28 MHz dipole
40-2CD: 2-el 40M beam
A50-6, A50-5, & A50-3 6M beams
617-6B: 6 Mtr Boomer
AR-6: Ringo for 6 meters
ARX-2B: Ringo Ranger II
ARX-220B: Ringo Ranger II
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air. However, the unnecessary use of HR (here) is a bit aggravating. There is no need to send NAME HR, QTH HR, RIG HR, WX HR, etc., during contacts. The facts obviously apply to the name, QTH, rig, WX, etc., of the transmitting amateur.

Work/Ending Signs. If you want to avoid using callsigns at the transfer of transmission to another amateur, it is okay to use the break sign (letters B and K run together). The other operator should send just the break sign before continuing the contact. These break exchanges are legitimate as long as no transmission exceeds three minutes, and identification is made within each ten minute time span. Many newer amateurs add the letter N after the invitation to transmit sign (the letter K). There is no recognized and approved meaning of this practice in the International Morse Code. When the Novice bands were established during 1951, many of us did add the letter N after the letter K to indicate that we only wanted a Novice (N) to answer our CQ calls. The end of message sign is the letters A and R run together. It only means the end of a message; it does not mean answer. The letter K is the invitation to transmit. It is appreciated when proper ending signs are used.

QRZ? Use. If you want to make a CQ call, please do so properly. I often hear an amateur come on a frequency sending QRZ? instead of transmitting a normal CQ call. This is a bad procedure which unfortunately is also used by some experienced amateurs.

Names. If you have a name that is easily confused between male and female, it is good to state whether you are an OM or a YL. Names such as Carole/Carol, Dana, Jackie, Leslie, Lynn, Marian/ Marion, and Pat are questionable to foreign amateurs, as well as to many American operators.

Bad Practices. Identify properly. If your callsign is WA6VTN, for example, do not use VTN as a short identification. It is illegal and improper to do this. Better operators do not respond to improper identifications. Another bad operating procedure involves amateurs who answer CQ calls and immediately send their RST, QTH, and name data without allowing the amateur who sent the CQ call to recognize a preferred answering station. It is not unusual to have more than one station answer a CQ call, and the amateur who sent it may prefer to answer a station other than the one who is improperly sending their RST, QTH, and name data. Do not make directional calls such as CQ VT (Vermont) unless you have previously determined that the desired area is being heard on the band you are using. Do not usurp a frequency from another amateur. If you answer someone's CQ call and complete a contact with her/him, it is proper to leave that frequency to the amateur who made the initial CQ call.

Foreign Codes. A previous article covered American Morse, Arabic, Continental, Greek, Hebrew, International Morse, Japanese, Russian, and Turkish codes. This 12-page article also includes coverage of code advantages, code tests, correcting sending errors, code practice devices, dit-to-dah relationships, handkeys, headphones, keyers, learning code, operating tips, semi-automatic keys (bugs), sending tips, what code is, why code is not CW, and the word count system. A free copy of this article is available to anyone who requests it and provides a self-addressed large (10 by 12 inch) envelope with double first-class postage attached to it. Such requests should be sent to my California address, which appears on the first page of this month's column.

Code Tapes. If you have little (or no) knowledge of the International Morse Code (also known as the International Telegraphic Alphabet Number One), I have a set of 15 cassette tapes which can be used to take one from no knowledge of this code to a receiving speed of about 15 words per minute. These tapes have been used very successfully by several thousands of my ex-students. They include tips on shortcuts used by top code operators. The cost of a complete set of

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these tapes is $35, which includes shipping and handling charges.

Summary. I hope the information in this article helps you. I realize that the current degraded condition of the 10 meter band has caused many Novice and Technician-Plus amateurs to shift from 10 meter voice operation to code on other Novice bands. This article is intended to provide that group with some practical tips.

YL International SSB'ers

The primary purpose of this organization is handling emergency traffic. V. Mayree Tallman, K4ICA, founded YL International SSB'ers Inc. on 9 February 1963. It has handled such traffic very well during the past 30 years. About 15,000 members are scattered all around the world in more than 250 countries. Their *Voice* publication contains a list of members, photographs, and their award requirements. A copy of the *Voice* is sent to each new member. Their monthly bulletin is the *Communicator*, which is free to each member who sends an SASE with a request for an issue. This group operates a QSL Bureau for its members.

The dues rate is $10, with membership free to additional amateurs in the same family. Membership requests should be sent to Pablo Neiman, N5JRE, 209 Pine Trail, Higden, AR 72067.

The group meets on 14,332 kHz. Their early morning informal warm up starts at 1300 UTC or 1200 UTC (when daylight savings time is in effect). It switches to a formal system three hours later. Three two-hour formal sessions follow the informal warm-up activity. The daily rotation on the formal sessions are amateurs in the first, zero, fourth, seventh, third, sixth, ninth, second, fifth, and eighth callsign districts. The moonbeam system starts at the conclusion of the formal sessions (2200/2100 UTC), and it is continued until the band closes. The moonbeam system is very popular with amateurs who cannot operate during daily working hours. Tom Wuelfing, WA1GAG, conducts an information session starting at 1500/1400 UTC Mondays.

Annual code and SSB parties provide fun on the air. An annual convention is rotated around the country to enable members to have eyeball QSOs.

The regular system is used Mondays, Wednesdays, and Fridays starting at 1900 UTC on 21.373 kHz. The VK/ZL system starts at 2200 UTC on 28.673 kHz Wednesdays, 0200 UTC on 21.373 kHz Thursdays, and 0230 UTC on 14.332 kHz Saturdays. The other frequencies that are used by this group are 3565, 3873, 7065, 7273, 14065, 21065, and 28332 kHz.

All amateurs are invited to participate in one (or more) of the on-the-air systems that are operated by YL International SSB'ers. You are welcome to listen to the activities and to participate in them. If you like what you hear, you may decide to join this organization. If you need a few states or countries, this group will help you make those desired contacts.

Printed Aids

My previous columns contain information that is useful to new and aspiring amateurs. Many of these items have been reprinted for distribution to students of licensing courses I instruct. For ease of use, these printed aids have been separated into six categories. These categories are introduction, code, theory, station, operating, and miscellaneous. Outdated items are continually replaced with newer material. Fifteen dollars brings a complete set of current printed aids, including shipping costs. A list of these printed aids will be sent to anyone who requests it and sends a business-size (#10) SASE to my address. Licensing-course instructors are welcome to revise and/or duplicate these items to suit their needs.

73, Bill, W6DDB

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High-Claimed Scores

The following are early-bird high-claimed scores as of July 1, 1993. These are raw scores subject to verification.

SINGLE OPERATOR UNITED STATES ALL BAND

KM1H	7,025,136
WN4KKN	5,804,832
K3ZO	5,196,824
K7RI	5,102,520
N7AVK	4,824,693
KF3P	4,740,040
KM5X	4,380,993
NI8L	3,831,164
NN7L	3,674,308
AI7B	3,646,008
W3BGN	3,046,428
WAØPUJ	2,519,478
WZ4F	2,414,820
KF2O	2,179,743
K3WW	2,030,004
K2POF	1,945,386
AA2GQ	1,917,065
K4VUD	1,864,356
KE9I	1,852,128
WØRRY	1,776,170

28 MHz

WF1L	901,446
NU4Y	626,560
NW6S	616,900
WØACT	135,034
WA2SYN	122,791
KA8D	102,711

21 MHz

KA2AEV	3,859,436
NB7N	569,380
W7FP	509,913
WB2YQH	509,580
KD1GJ	494,265

14 MHz

WD8LLD	1,076,250
K6XT	500,193
N6WR	232,560
W1LQQ	114,330
W4/HK3GZB	75,712

7 MHz

WB2ULI	237,456
WAØETC	146,556
NX7K	54,834

3.7 MHz

WE3C	887,044
KI6P	717,590
KE2JO/4	62,748
KØCS	32,240
KG5JH	25,728

1.8 MHz

AA4MM	34,584
WA6IET	1,232

LOW POWER ALL BAND

W9NQ	1,730,820
N1HOQ	1,187,367
KE2ZU	921,393
WA2EOV	875,472
WS1A	868,502
ACØW	863,154
NZ5O	732,875
NU7I	482,886
N6WLX	458,292
AA4EL	409,700

28 MHz

KJ6HO	182,406
K6SVL/4	157,731
KB4TLH/T	125,541
W6PYX	90,285
KD6KUI	61,050

21 MHz

N5NMX	760,529
N4MO	722,728
NY5B	440,428
WT5U	417,749
WZ8T	391,310
NW5H	220,039

14 MHz

K9KU	188,086
WØMHK/W1	174,896
WQ7R	170,500
W5FO	162,400
W6OUL	54,776

7 MHz

WA6WPG	15,960

3.7 MHz

KE5FI	35,868

1.8 MHz

AA9AX	5,656
NOØY	2,160

DX SINGLE OPERATOR ALL BAND

P4ØV	19,636,950
EA8AH	17,608,199
KP2A	16,766,553
XK3EJ	10,700,217
5U7M	10,222,656
WR6R/WH6	9,803,972
3G3R	9,104,494
ZL3GQ	8,481,789
4X/S59PR	8,302,143
CR9R	7,419,272
HC7SK	6,873,680
LZ5W	6,370,000
JH7PKU	5,184,564
A61AD	5,053,128
9K2ZZ	4,301,246
VK5GN	4,130,580
HK3JJH	3,878,699
XK5MX	3,823,480
4T4ANR	3,777,757
VS6WO	3,743,238

28 MHz

ZPØY	10,700,915
PY3OC	5,363,820
C91J	3,637,857
V73CK	2,191,563
CT8T	941,147

21 MHz

KG6DX	6,597,812
ZD8LII	5,456,589
KI6EZ/NH6	4,944,027
AL7CQ	3,659,568
S56MM	3,311,963
OK1RI	3,028,065
LU1HOO	2,933,856
S57EK	2,835,924
9A1CCY	2,616,132
OH2HE	2,578,752
OHØMAM	2,391,270

14 MHz

EA9LZ	6,248,502
HK1HHX	5,851,587
YW1A	5,223,960
5Z4BI	3,778,488
OH2BH	3,735,324
OH1EH/OHØ	3,544,500
7L1GVE	3,022,020
GW4BLE	3,004,701
9A7A	2,517,606
CT3BD	2,433,660

7 MHz

IO4VEQ	4,374,384
T32AF	4,033,920
YV5MRR	2,793,338
KH6XT	2,546,950
XB2I	1,801,500
F6EZV	1,671,320
4V2B	1,528,800
DJ7AA	1,522,560
OH5BM	1,002,300
F1NBX	872,490

3.7 MHz

XK7CC	1,320,926
S53EA	1,136,930
DL3LAB	635,600
IK3ORD	622,660
OM3TZW	544,578

1.8 MHz

OM3CQD	105,878
4N4DD	88,086
F6AML	38,870

LOW POWER ALL BAND

ZD88V	14,564,834
VP5G	6,634,896
3XØHLU	3,849,522
LU2NI	3,487,328
VP2E/NR1R	3,167,888
EA8BWW	2,875,575
NP2I	2,760,643
XJ4VV	2,723,680
XK7SV	2,618,356
CUØWPX	2,472,000

28 MHz

ZY5C	1,871,921
WP4WD	1,804,520
LU1VK	1,645,296
5H3MT	1,347,780
LU6EJP	1,231,367

21 MHz

EA9UK	3,696,440
TGØAA	1,485,320
CX7BF	1,343,146
JR7OMD/2	1,302,623
JQ1NGT	1,197,380

14 MHz

7Q7XX	1,033,270
CT1BWW	638,675
CT3DZ	484,408
EA6WX	315,774
XO2AC/XK1	263,676

7 MHz

LZ1ZX	539,110
RB5QRW	489,108
VF3SRE	284,616
LZ2ZY	96,768

3.7 MHz

RB5DX	504,900
S59DRJ	340,000
YV4DSB	286,344
HA4XN	259,076
UA9DE	236,208

1.8 MHz

OZ3SK	104,876
UB5FAN	45,372
S53TK	26,264
RB5ILZ	25,208

QRP/p UNITED STATES

KR2Q	A	996,792
AA2U	A	738,843
N1AFC	A	588,392
WB6JMS	A	274,055
N7RWH	A	226,452
WB4KRH	28	81,030
WA6FGV	28	51,684
W6CN	21	44,745
KS9U	14	326,988
W8QZA/6	3.7	540

DX

F1BEG	A	439,766
EA3FVS	A	306,333
UWØSR	A	263,889
YU1KN	A	219,081
SM3DZH	A	204,516
UWØST	28	57,081
JF3EIU	28	40,932
DU1CHD/6	21	96,896
RW9QA	21	80,541
RB5EG	14	191,646
JL6IPK	7	560
4M1G	3.7	47,616

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AA8U	5,617,863
W7ZR	5,391,684
KI1G	4,721,517
W6EEN	4,692,650
WU7Q	3,962,546
KE3Q	3,916,890
N7TT	3,337,236
NO9Z	3,251,409
NJ1V	2,329,094
KY2T	2,221,638
WZ3T	2,192,877
KK4JF	2,101,551
ABØS	1,651,660
NU1H	1,404,200
K2PS	1,358,448

DX

HC8A	32,509,269
ZXØF	31,059,544
PJ9X	25,678,215
VP2EC	22,462,276
TO5M	17,310,349
C49C	16,387,756
P2ØX	13,440,570
TM7C	12,649,637
CT5P	12,479,320
TK6A	11,599,760
GB6BT	11,313,840
PRØR	11,036,112
EL2PP	10,578,167
TM2V	8,484,040
CE6EW	8,332,632
JH5ZJS	8,085,615
PT7CB	7,962,741
WL7E	7,805,280
YW59M	7,683,840
EA3KU	7,653,996

MULTI-OPERATOR MULTI-TRANSMITTER UNITED STATES

WZ1R	11,126,585
WK4Y	8,854,545
WX3N/Ø	8,771,860
N8BJQ	1,135,200
NK3U	1,017,344

DX

LU4FM	28,369,173
XK7SZ	22,633,136
9A1A	18,456,290
OT3A	17,251,069
HG73DX	15,652,197
UX9C	15,078,492
PX4B	14,126,786
CZ7Z	13,234,540
US7I	12,307,950
7Z2AB	8,779,886

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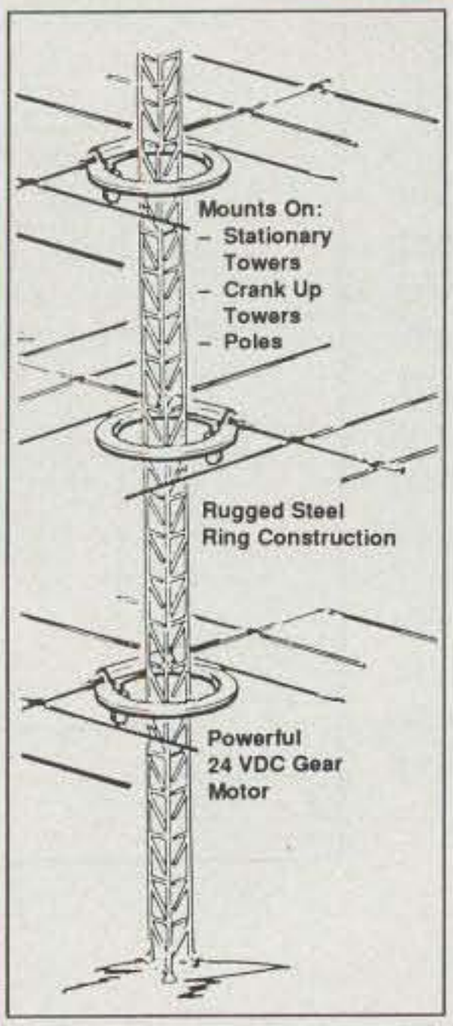

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MATH'S NOTES

BY IRWIN MATH, WA2NDM

WHAT'S NEW AND HOW TO USE IT

Simple Calibration "Standards"

We all use test equipment; that's for sure. But how do we know that a reading of 1.000 volt on our DVM, for example, is really 1 volt or that the 22K resistor is really 22.0K and not 20K or 23K? The answer to these questions is we really don't know. We simply take for granted the fact that the manufacturer calibrated the meter (or oscilloscope, signal generator, or frequency counter, for that matter) when it was manufactured, and even though ten years may have passed, "the unit, of course, must still be within original specifications." The situation is even worse with equipment having digital readouts. The fact that three, four, or five digits may appear on the dial leads to a false sense of security.

"So what?" you might say. "Who needs to know voltage, resistance, or frequency to accuracies of a percent or so?" Well, my friend, we live in a world where all types of electronic equipment, from TV sets to amateur transceivers, are becoming more and more complex—a fact that requires more exacting measurements of critical parameters than ever before. Imagine, for example, setting the VCO voltage in a UHF TV tuner, where a 0 to 5 volt span may cover 470 to 890 MHz, with a DVM that is 5% out. Or imagine the problems of setting a basic 150 MHz oscillator, which will then be multiplied up to the microwave region, with a frequency counter that reads a few percent low. You can miss the band completely!

The answer is, of course, to have a few known standards around which you can use to calibrate your test equipment. For a basic experimenter's lab, a good voltage reference, a frequency standard, and a couple of precision components should go a long way toward eliminating test-equipment errors of the type just mentioned.

Fig. 1 is a schematic diagram of a voltage standard using a National Semiconductor LM368–2.5, which will provide an output of 2.500 volts with an accuracy of

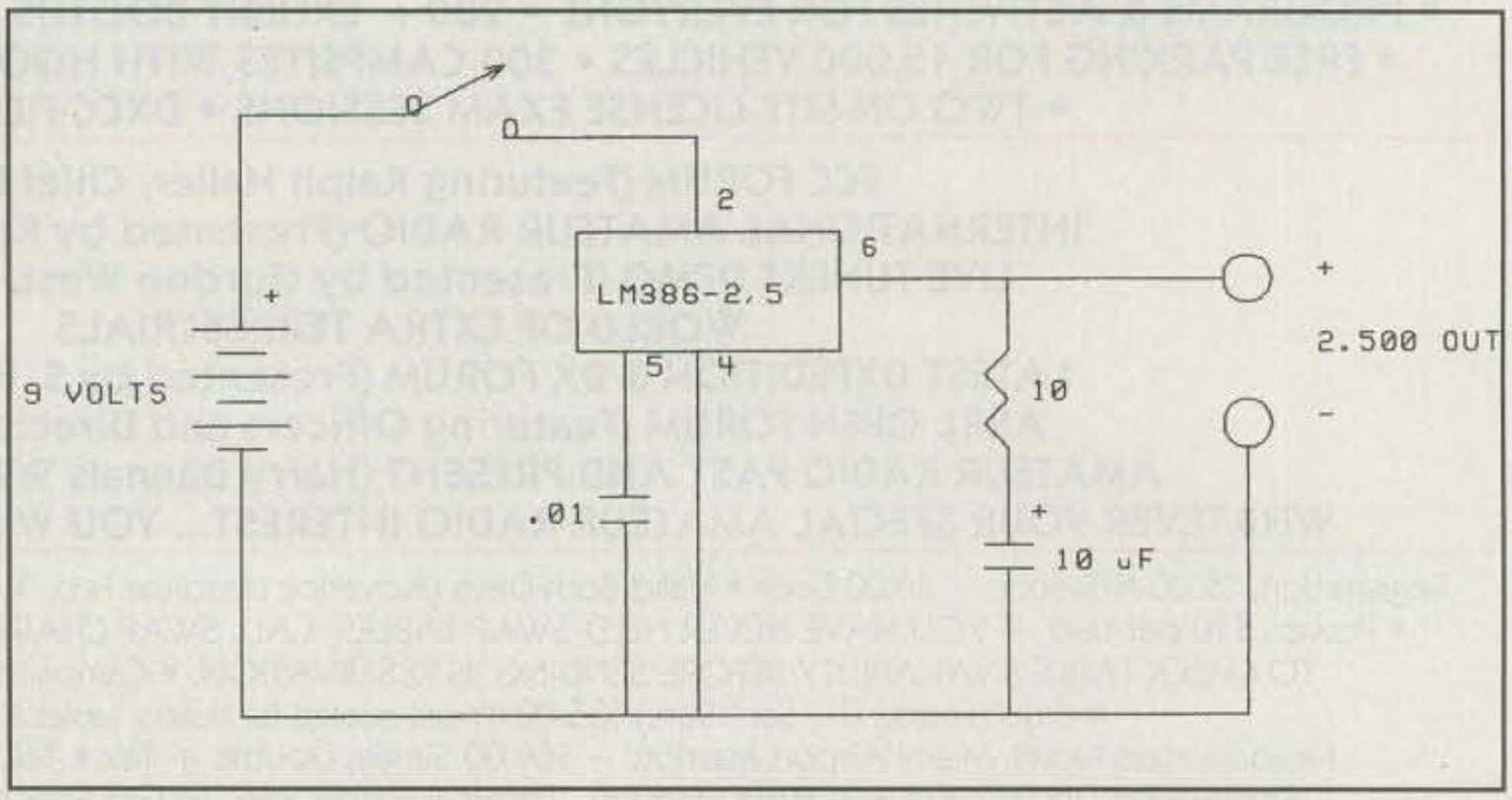

Fig. 1– Precision voltage standard.

±0.2%. It is simplicity in itself, and draws so little power (0.4 ma) that even a 9 volt battery will operate it for weeks. The device is short-circuit proof and stable enough to regulate its output to within ±1 millivolt over an operating temperature range of 0 to 70 degrees C. Furthermore, input voltage variations (line regulation) are insignificant.

Building the circuit is not critical, as there

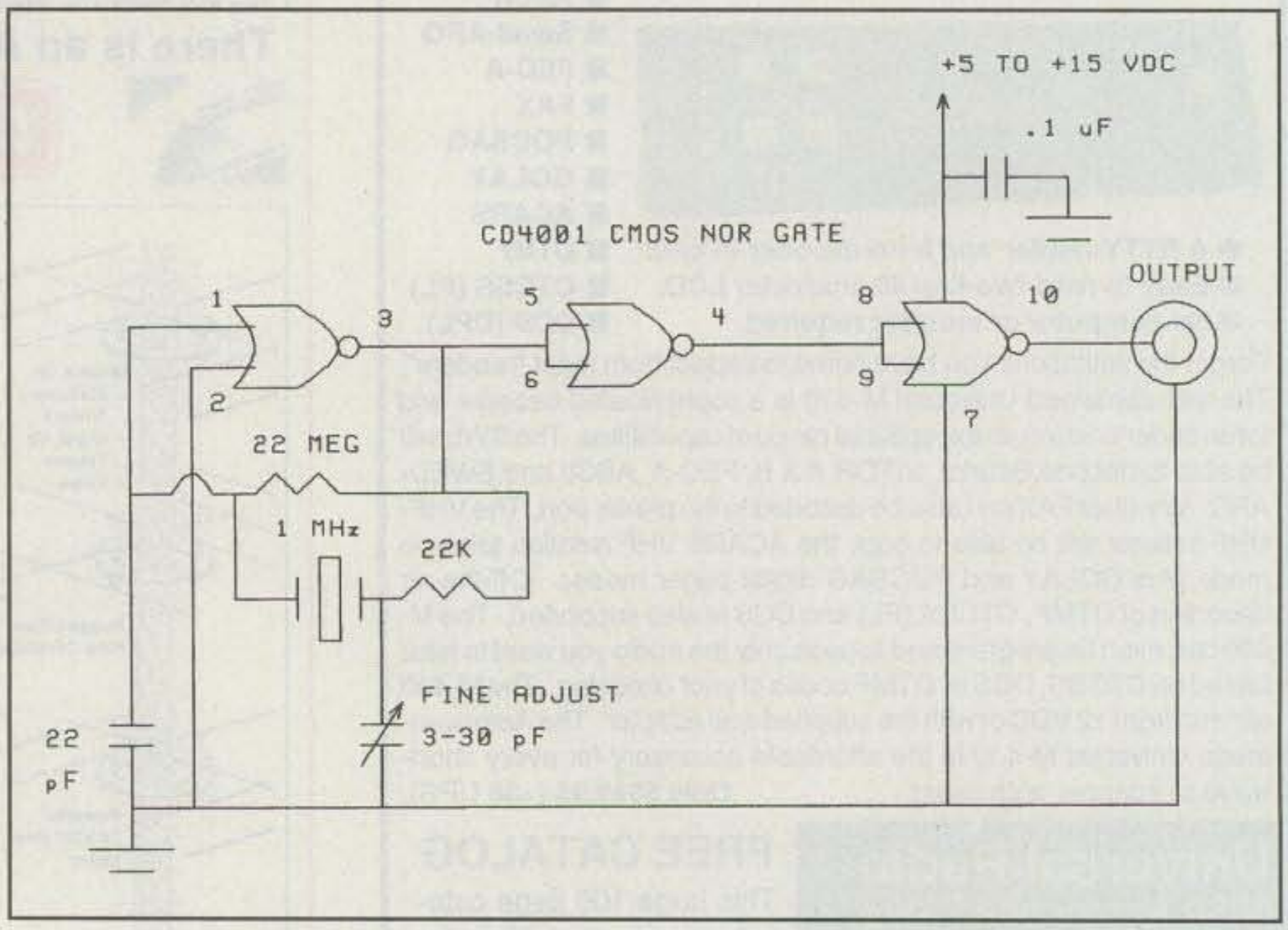

Fig. 2– One MHz precision "frequency standard."

c/o CQ magazine

Say You Saw It In CQ

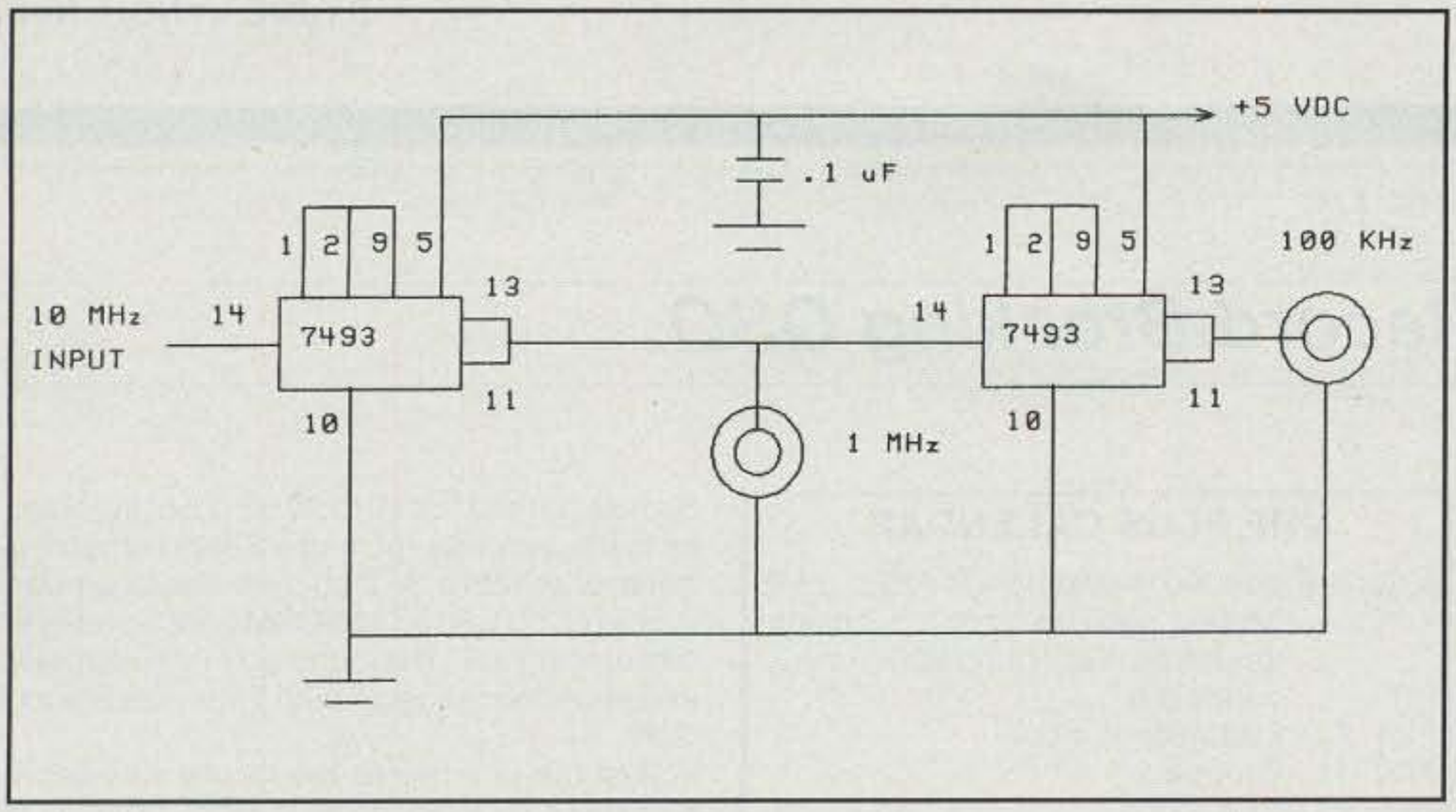

Fig. 3– Divide by 10/100 for frequency standard.

is almost nothing there. A suggestion is to mount the chip, tip jacks, battery, and other components in a small plastic box, and then mount the box to your workbench with Velcro®, so it can easily be used to check a meter from time to time.

Another useful device is a precision resistor. Ohmmeters are not always as accurate as we would like, and such a resistor can easily tell you "where you are." Metal film resistors with accuracies of 1% are easy to obtain and are relatively inexpensive. A small mini-box fitted with a set of tip jacks to which 1K, 10K, 100K, and 1 megohm film resistors are connected will cost a few dollars, and they will retain their accuracy for many years as long as they are not overloaded.

With regard to frequency, the 1 MHz oscillator circuit of fig. 2 can easily be built on perf-board, and will produce useful harmonics, every MHz, to at least the 30 MHz region. Even with inexpensive crystals, such an oscillator will hold its stability to better than 1 ppm (1 Hz) and can be fine-tuned by adjusting C1 to zero beat the output against WWV or WWVH. Build the standard in a mini-box for shielding, and use a BNC connector for the output. If you are really enterprising, you can use a 10 MHz crystal, add a divide by 10 and 100, and wind up with a frequency standard that gives 10 MHz, 1 MHz, and 100 kHz pulses. I'll leave the actual circuitry of the oscillator to your imagination (try fig. 2 with a 10 MHz crystal for starters). However, a suitable divider scheme is shown in fig. 3.

While the above project may seem simple-minded to some readers, the use of such standards easily can point out faulty test equipment and bring your measurements to a new degree of accuracy.

73, Irwin, WA2NDM

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CIRCLE 128 ON READER SERVICE CARD

VHF PLUS

BY JOE LYNCH, N6CL

ALL ABOUT THE WORLD ABOVE HF

Record-Breaking QSO

Two years ago this month I began this column with the same headline. Then I described the record-breaking SHF QSOs between Chip Angle, N6CA, and Paul Lieb, KH6HME. On 28 July of that year Chip and Paul managed two record-breaking QSOs on SHF. The first was on 3456.1 MHz and the second, an hour later, was on 5760.1 MHz. These two QSOs established new terrestrial records of 2469 miles (or 3973 km) for each band.

Well, the dynamic duo did it again! This time they were on 902 MHz where they made a two-way CW QSO, completing at 0136 UTC on 23 August. Again the distance was 2469 miles. (This record eclipses the old record of 1072 miles held by Al Ward, WB5LUA, and Ott Fiebel, W4WSR. However, because of the distinction between "over water" and "over land" in record keeping, Al and Ott will retain the over-land record for this band.)

After completing on 902 MHz they then switched to 2304.1 MHz and ran for about four hours, but with no success. During their run they had excellent conditions on 144 MHz, allowing for continuous coordination via that band. They reported that 432 MHz was also open at various times during the run.

Chip stated that he was alerted to the potential for a record breaker when conditions were such that he could copy the 2 meter Hawaiian beacon from home, a fete not normal when the band is open because of his being blocked by the Palos Verdes peninsula. After informing Paul of the potential conditions, he started out to the peninsula. He noted that as he drove over the peak he momentarily lost the signal. However, back down, now on the ocean side, he easily reobtained it and noted that it was quite loud.

Chip has a theory that states if the signal seems to be low lying, such as this one was, then the potential for higher band conditions seems more likely. Hence, when he noticed this phenomenon on this trip, he was quite encouraged. It only remained for Paul to get on location on the side of the volcano, a fete that takes around two hours.

For the contact, Chip was located at the 360 foot rise on Palos Verdes Peninsula and Paul was at the 8200 foot level of the Mauna Loa volcano. Equipment on both ends was 902 to 28 MHz transverters with 0.6 dB noise figure front ends. They each ran 12 watts output into 12 foot loop Yagis. Congratulations, again, guys and good luck on 2.3 and 10 GHz.

Incidentally, one never knows when, where, or how the duct may be in. Gordon, WB6NOA, and Suzie West, N6GLF, noticed this phenomenon when they were piloting their Cessna 182 around southern California during the *Perseids* meteor shower. When they reached the 8000 foot level they suddenly started picking up the Hawaiian beacon on 2 meters (with just a TR 751 and an M² SQLOOP suction-cupped inside the back window of the plane). Gordon reported that as Suzie flew higher or lower they would quickly lose the signal. Gordon observed that stratification within the atmosphere can create a tropospheric duct that is extremely shallow in depth.

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VHF PLUS CALENDAR

Nov. 6–7	Second weekend of ARRL EME contest. See last month's column for details. Very good EME conditions.
Nov. 7	Last quarter moon.
Nov. 11	Perigee.
Nov. 13	New moon
Nov. 14	Poor EME conditions.
Nov. 17	*Leonids* meteor shower, predicted peak, 1015 UTC. Noisy EME conditions.
Nov. 21	First quarter moon. Good EME conditions.
Nov. 23	Apogee.
Nov. 28	Moderate EME conditions.
Nov. 29	Full moon.

Another Record Breaker

During the first weekend of the ARRL 10 GHz cumulative contest, Jack Henry, N6XQ, operating as XE2/N6XQ, and Dave Glawson, WA6CGR, established a new North American X-band distance record of 632.86 miles, or 1019 km. At 1600 UTC on 23 August Jack, located on the Vizcaino Peninsula in Baja California Sur, worked Dave, located at Point Sal. Signals ranged from 0 to 20 dB out of the noise on SSB. Jack was running a 3 watt homebrew transverter with a 30 inch dish, and Dave was running a converted MA/COM transverter system running 1.25 watts and a 27 inch dish. Receiver performance on both ends was around 3 dB.

Just the day before the record was set at 613 miles by Chip Angle, N6CA, Dave, and Gordon Lewin, WB6YLI, all operating from Refugio Pass, near Santa Barbara, and contacting Jack at Vizcaino Peninsula. At one point Dave reduced power to 200 mW and switched his antenna to a feed horn and still maintain contact with Jack.

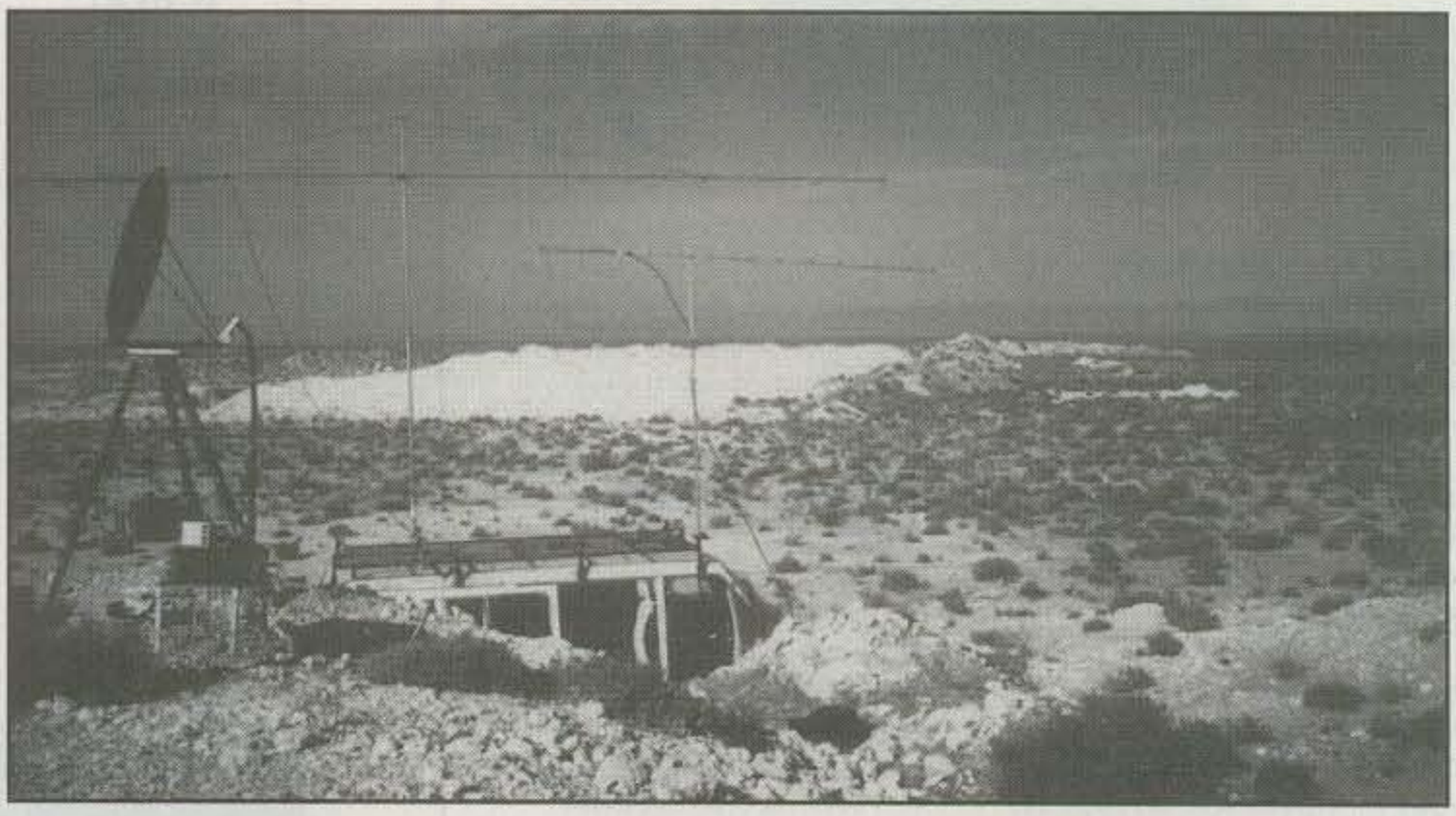
As a footnote, to attest to the conditions on the days surrounding these contacts, Chip, while at home in Lomita, worked Jack, while in Mexico, on 2 meters, using only *10 micro watts!*

Following the record-breaking contact, Jack made 6 additional contacts on X-band, while Dave and Chip made contacts on X-band from their mobiles while in motion.

August *Perseids*

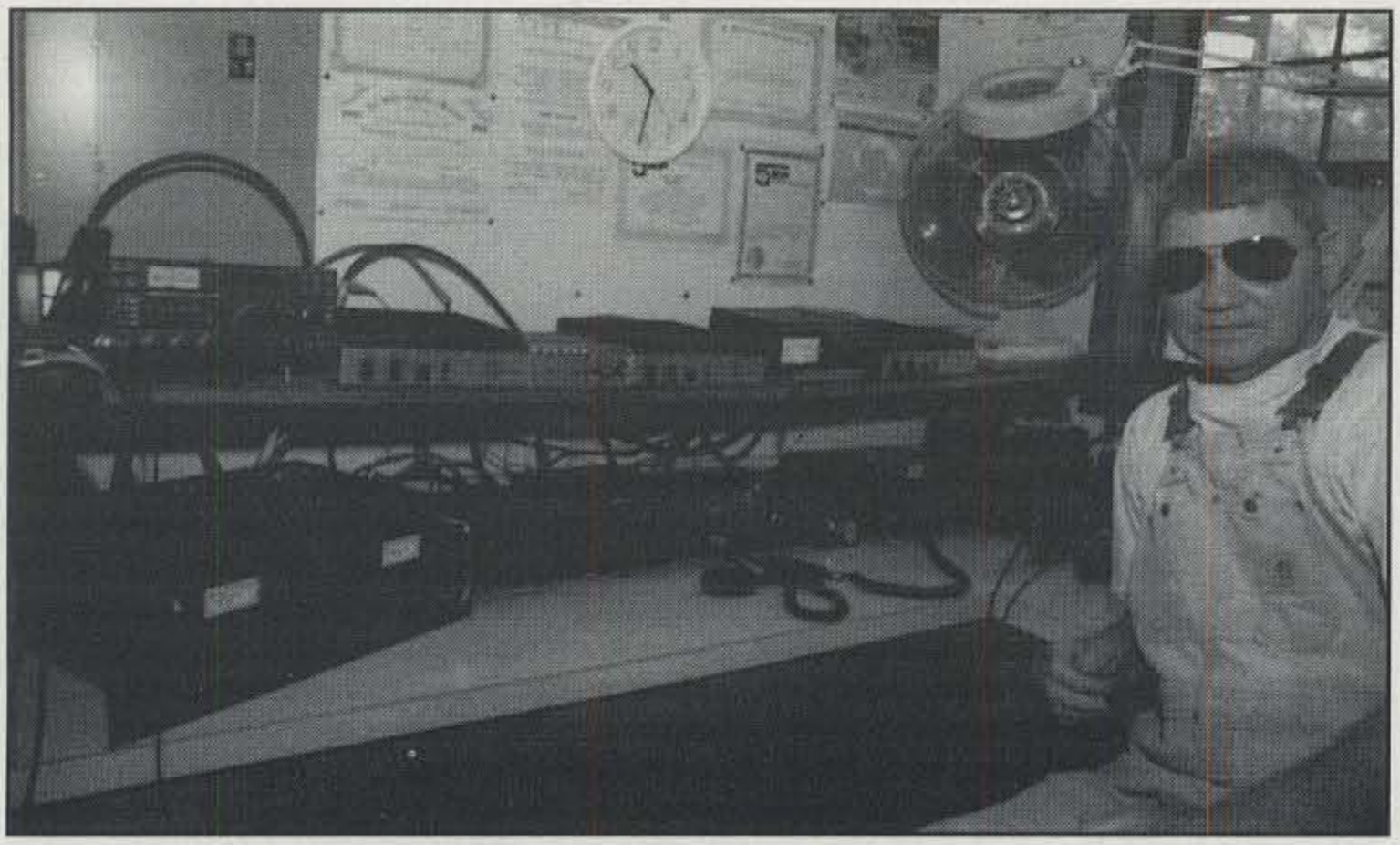
The consensus of those who played in the *Perseids* meteor shower was that it did not live up to its advanced billing—not in the least. Nevertheless, it was a good shower. Several stations reported completed contacts. And that is the importance of a shower—being able to complete contacts.

What was notable—and pleasantly surprising also—was the sheer number of operators on the air during the days surrounding the shower. Reports from all over the country indicate that new and old operators alike were looking for contacts via the meteors. Perhaps



Jack Henry, N6XQ, operated as XE2/N6XQ from this Vizcaino Peninsula, Baja California Sur, QTH while breaking the North American X-band DX record. (Photo courtesy N6XQ)

Say You Saw It In CQ



Super-active meteor chaser Larry Jones, WB5KYK, is shown here waiting to work you via the meteors. (Photo courtesy WB5KYK)

this is an indication of the potential for populating the VHF+ frequencies. We who operate on them regularly can only hope so.

What about next year? In a conversation with my friend, Joe Rao, he stated that he is aware of a couple of British astronomers who have indicated that next year has a more likely potential for a storm and that 1995 will also produce a good show. Alan MacRobert, of *Sky and Telescope* also relayed that report to me but added that Harvard University's Brian Marsden felt that their predictions were based on incorrect orbital numbers. Nevertheless, a theory put forth by Joe is that because the 1965 *Leonids* shower did not live up to its prediction, even though it occurred close to the perihelion of the Temple-Tuttle comet, and because the 1966 *Leonids* was a storm, it may stand to reason that the same conditions will affect the 1994 (and possibly the 1995) *Perseids* meteor showers. One can only guess.

What follows are reports that your editor has received to date.

Mike Tessmer, NØBSH/9, reports the following: On 12 August he worked the following: WD5EWD, EM23; N5FA, DM91; N5HHS, EL29; W3ZZ, FM19; K2TXB, FN02; K8GW, EN91; N3AHF, FN20; K1LL, DN84; K2QE, FN23; WS1C, FN41; N1DPM, FN42; KM3T, FN41; N8NQS, EN72; KZ2S, FN20 (only one on sked); W3XO, EM00; WV3X, EL09; K3HCX, FM19; WV2C, FN30; WQ5S, EM13; KN4SM, FM16; K1HTV; WA4PGM, FM07; KC4YO, EM75; WA4CVHA, FM18; N6CL, EM15; WB4DBB, FM07; NE4C, FM06; K2GAL, FM29; VE3KDH, FN03; WA3HMK, FN10; W9IP, FN24; VE2SWL, FN35; KB7FUV (heard over two minutes!); NW3C, EN90; W2MGF, FN03, N4BDH, FM16; N5JHV, DM62; WB5LUA, EM13; K7ICW, DM37; KE7NS, DN41; KØRI, DM79; W1XE; NØKV; WB7Q, DN65; NW7O, DN10; WØETT; KC7IJ; N5TQP, W5VY, N5RSS, EM14, and WØKEA. Also worked on tropo were WAØTKJ, EM18; WG8Q, EN82; N8DJB, EN81; N8ERM, EN72; KI8G, EN82; WA8WZG, EN81; WA8MZQ, EN80; K5YY, EM36; and K5SM, EM26. Additionally, N8DJB was worked on tropo on 432 MHz.

Ken Ramirez, KH2F/W3, reports that he worked 21 grids during the shower, to complete his VUCC on 2 meters. What is unique about this is that Ken lives in an apartment and has to go out portable. His first time out was last year's September VHF QSO Party. During that contest he worked 77 grids. He worked two more right after the contest. With the total from the shower he now has VUCC in slightly more than two days on the air (49 hours, to be exact) and then operating portable. So, there you have it. Anything is possible if you put your mind to it!

John Webb, W6RCW, reports the following contacts on 6 meters from Eagle Lake, Lassen County, California, grid square CN90: On 11 August, WØKEA, DM69, KB7FUV, DN44; W7HAH, DN26; KØYBX, DM69; and WA6QAK, CM98. On 12 August, KØYBX, DM69 (long bursts); W7HAH (again, for ten minutes, working W6s); WB9AJZ, CM86; NW7O, DN10; KC7IJ, DN44; VE7FEI, CN88; VE7BG, CN88; W7AWA, CN87; N7DB, CN95; and WB6SYB, CM95. John noted that between 12650 and 1750 on 12 August conditions seem to be a combination of meteor scatter and sporadic E. He says he will try to be on from another rare grid next year, hopefully to include 2 meters.

Greg Poel, KC8P, went to three grids during the predicted peak days. All of his contacts were made on 2 meters. Between 0900 and 1130 UTC on 7 August he was in EN65, where he had three completions out of four skeds. Between 0400 and 0700 on 10 August he was in EN57, where he had three completions out of six skeds. Between 0400 and 1100 on 11 August he operated from his car on the line of EN57 and EN67. He had seven completions out of fourteen skeds. Between 1630 and 1900 and around 2230 on 11 August he was within EN57, where he had three completions out of seven skeds.

Between 0430 and 0830 on 12 August he was on again from EN57, where he had 11 completions out of 13 skeds. He stated that this time frame was the best period of the several days of his operation. He said that he noticed many rocks and many long burns. He reported that signals were louder but not real strong. He further reported that most of his skeds were completed within 10–15 minutes, the shortest being one minute.

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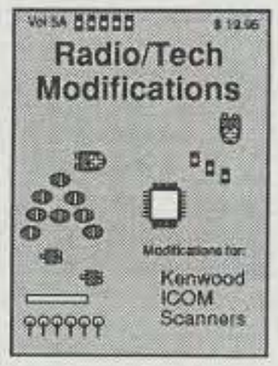

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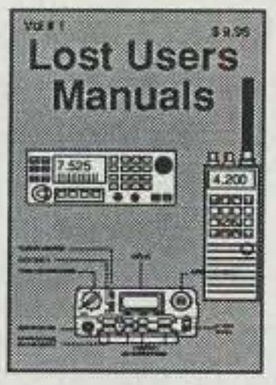

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Between 1400 and 1800 on 12 August he again operated from the EN57/EN67 grid line, where he had five completions out of eight skeds. Between 0230 and 0500 on 13 August he operated within EN67, where he had two completions out of three skeds. Greg's final tally was 34 QSOs in 28 grids, 13 states, and one Canadian province. He said that no QSO was greater than 1000 miles. Unfortunately, advance publicity of his trip was lost on my answering machine when lightning struck a nearby power pole and sort of messed things up.

Charlie Calhoun, WØRRY, reports the following: On 9 August he completed a sked with KB7FUV (DN44). On 10 August he completed skeds with WA8WZG (EN81), KF5IU (EM31), and AB4CR (EM78). He was heard by CO2JA during their sked. On 11 August he completed skeds with NØJPE (EN13), K1LL (DN84), WE7L (DM41), NC7K (DM09), WB6WLR (DM13), K8BZH (EN75), and VE3FGU (FN02).

On 12 August he completed skeds with WA9LWJ (EN54) on both 6 and 2 meters, KØBI, NW3C, KE7S, N9MKC (EN71), W7XU (DN15), K6AAW (CN80), WA7JTM (DM33), WA2GSX (FN13), and K9OYD (FM18). On 12 August he completed random contacts with the following: KB3ML, W4DR, N8PJP, VE3FGU (FN04), W8WN (EM77), AA4ZZ (EM95), WA3HQK, N3AHF (FN20), K2TXB (FN02), VE3KDH (FN03), W8IDU (EN83), NØHJZ (EN24), W9ZR, KH2F (FM19), WB4DBB (FM07), N2WK, N5JHV (DM62), N1GDP (FN55), N4KWX (FM08), and WG8Q (EN82).

He had a total of 44 QSOs in all ten call areas and one (VE3) province. His longest contact was 1495 miles west and 1494 miles east. He heard VE3FGU for 4 minutes on one burn! Additionally he heard XE3EB on one burst during the days of the shower.

Carl Huether, KM1H, reported the following: On 11 August he worked WA9LWS (EN54), NØAKC (EN44), WD4KPD (FM15), KC8P (EN57), KBØZQ (EN34), NØJRN (EM37), KØRDF (EM29), and KA2DRH (EM64). On 12 August he worked VE1KG (FN84), VE1HD (FN96), VY2WF (FN86), VE1PZ (FN85), VE1AHM (FN76), VE1COY (FN85), WX3N (EN52), K5UR (EM35), WB9UWA (EN50), W9BN (EM34), K2RTH (EL95), WAØBWE (EN34), KV8S (EM99), W9XT (EN53), K5SW (EN25), VE4ZK (EO21), WA5NOB (EM35), WAØNTT (EN35), KØFF (EM48), and WA4VWR (EM78). Carl's final tallies include 18 new grids and three new states.

Jon Jones, NOØY, observed several fairly good bursts on 2 meters between 1300 and 1600 on 12 August. He reported working W9ZR in EN80 at 1441 on a long, loud burst.

Dave Batcho, N5JHV, reported that he observed lots of activity. One burn of note was on the morning of the 12th his *CQ* was answered by a pile-up. He made contacts beginning in Minnesota and ending in Arkansas from just that one burn. For him, it was interesting to follow the trail of propagation as it developed during the burn.

Shep Shepard, W7HAH, reported that he worked four new grids on 6 meters and five new grids on 2 meters.

Herman Cone, WB4DBB, reported that on 135 cm he worked two new states and on 2 meters he worked seven new grids.

Chris Fagas, WB2VVV, reported that on 2 meters he worked N4PZ (EN51) over a 1300 mile path. Heard were: KD4WM, WØPW, WA4VWT, WB9UWA, WAØTKJ, and WB4JGG. Additionally, he worked WA4SOH (EM76) on 6 meters.

Can You Hear The Meteors?

Larry Jones, WB5KYK, notices it almost all the time he runs a sked. Gordon West, WB6NOA, noticed it (and described it as a "ZZZIIIPPP" sound) when he was working the *Perseids* meteor shower. Others have also reported the phenomenon of being able to hear the ionization of the atmosphere caused by the meteor burning up in it. What has been your experience? Let me know and I will write about it.

VE1HD To G4CQM Meteor Scatter Attempt

Following my conversation with Clarence Humber, VE1HD, concerning his attempt with Derek Hilleard, G4CQM, for a trans-Atlantic QSO during the *Perseids* meteor shower, I attempted to contact Derek via the telephone. Instead, I got his answering machine. I left a message indicating a desire to hear from him concerning the attempts. About ten days later came a two-page, single-spaced letter from Derek outlining events that led up to the 11 August attempt.

Derek reported that he lives about 8 km from the Atlantic Ocean coast in the south of England, on a hill that slopes downward to the northwest toward the ocean. Derek stated that he has pursued auroral E and sporadic E as possible modes for propagation for the trans-Atlantic attempt. He reported that his interest

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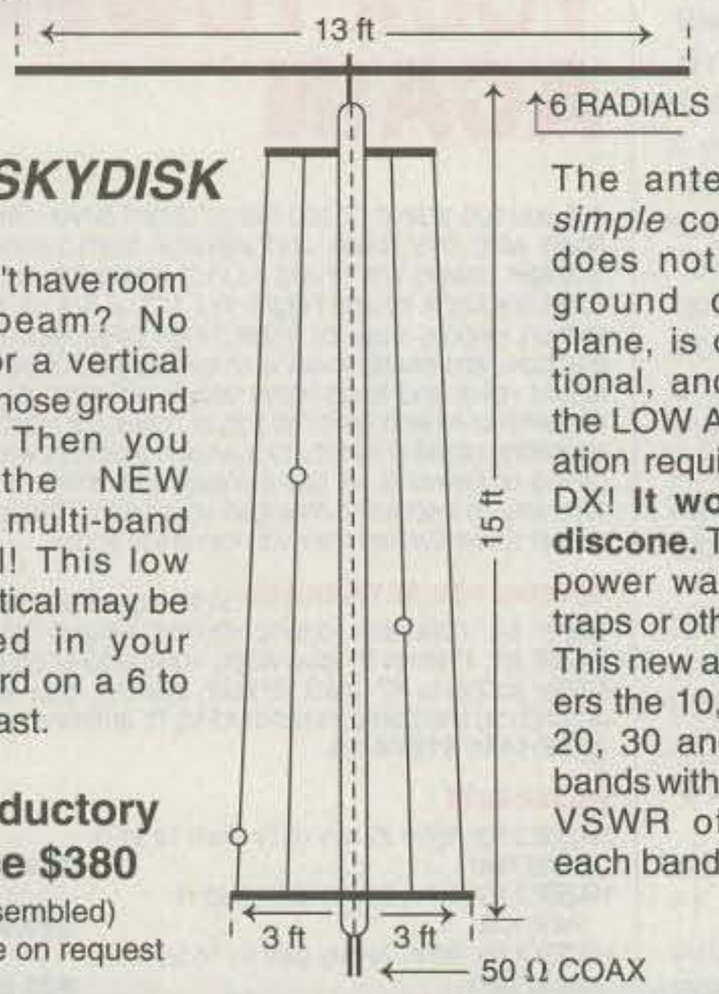

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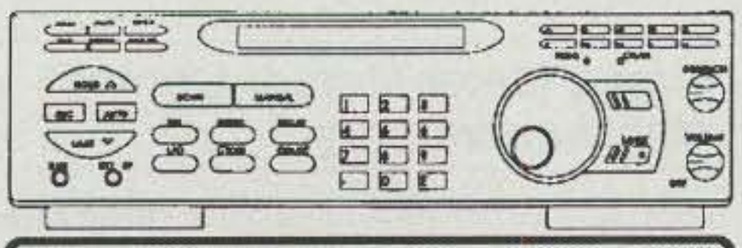

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in auroral E was spurred on by his 10 meter QSO with Don, VO1QF, during the massive aurora of 13–14 March 1989.

His interest in sporadic E was kindled by Mike, VE1MQ, who, himself, expressed an interest in making contact with Europe via the VHF+ frequencies. On 25 July Derek became aware of conditions that indicated the possibility of sporadic E propagation between Canada and England. He started a sked with Mike at 1430 UTC. At 1445 UTC Derek heard a voice in the noise but was not able to identify calls.

Because Mike had originally sought meteor skeds, Derek decided to run with him. Also expressing an interest in trans-Atlantic QSOs were Clarence, and Serge, VE1KG. Because of their interests and superior stations, Derek also decided to run skeds with them. All skeds were set for 11 August, the predicted peak of the *Perseids* meteor shower. When propagation indicators showed a lull in activity, he canceled the first two of his skeds.

However, when a check of the conditions showed a marked improvement at 2100, he and Clarence decided to run a sked with each other. Derek reported that during the sked there were times when he would hear a weak garbled signal that coincided with Clarence's transmit periods. Following the sked they spoke on the phone. Derek stated that Clarence spoke to him with a positive expression, saying, "I heard you; I recognized your accent; I heard your callsign and a portion of mine, three S units above the noise during your transmit period at 2207 UTC." Derek said that because of his inferior (to Clarence) power, he thought that he would hear something from him first and was quite surprised when the reverse proved to be true.

Derek then ran eight more skeds, three more with Clarence, three with Serge, and two with Mike, all with no other reports of signals or bursts. Derek stated that during the sked periods he did hear significant bursts of activity from the 88–108 MHz FM commercial broadcast band and that he heard European signals, quite often, on 144.200 MHz.

Will a contact be completed "across the pond?" Derek and Clarence are continuing to run skeds. Additionally, Derek has a list of North American FM broadcast stations that he will continue to monitor for possible indicators of propagation. We will continue to monitor their attempts and report on them here.

Books on Meteors

Meteors, authored by Neil Bone, is the title of a new book released by Sky Publishing Corporation under their *Sky and Telescope* Observer's Guides series. For the radio amateur this book give a great deal of insight into what is a meteor and how do it and Earth collide to form the visual (and, in our case, the electronic) observations we experience. Of importance to us, the book covers a brief history of meteor studies, and a season-by-season calendar of annual meteor showers and their characteristics. Additionally, a few paragraphs are devoted to our interest in meteor scatter propagation.

The International Meteor Organization's *Handbook for Visual Meteor Observations,* edited by Paul Roggemans, and also published by Sky Publishing Corporation, is another title that extensively covers meteor showers. Included are historical anecdotes of both major and minor showers. I use this book almost every month when preparing this column.

For your copy of *Meteors,* send $18.95, plus $2.00 s&h to Sky Publishing Corp, P.O. Box 9111, Belmont, MA 02178-9918. For your copy of the Handbook, send $18.95, plus $2.00 S&H to the above address. For your convenience, charge card orders are accepted via their toll free number of 800-253-0245, from 9 AM to 4:30 PM, Eastern time, Monday through Friday.

The artist at work. CQ staff photographer Larry Mulvehill, WB2ZPI, recently made a trip around the country to shoot pictures of, among others, well-known VHF+ operators for possible cover shots for CQ magazine. While at Kent Britain, WA5VJB's QTH Larry was "caught in the act" of setting up for the shoot. Incidentally, Larry's work has appeared in many places throughout the world. I came across a couple of his pictures in a college textbook I used in a course I taught for one semester two years ago. (Photo courtesy WA5VJB)

Current Meteor Showers

The *Leonids* meteor shower, scheduled to peak around 1015 UTC on 17 November, is a very active shower. Reports vary from year to year. However, in 1961, five years before the storm of 1966, the shower produced meteors in excess of 80 per hour. According to the *Handbook for Visual Meteor Observations,* the particle distribution is not uniform. In fact, there appear to be "clumps" of debris located along the orbital path. If this is the case, and if the clump that was present in 1961 has held pretty much together, then this year may also see a high (more than 50) hourly rate.

First 2 Meter Meteor Contact 40th Anniversary

What was lost in the shuffle of too much news in too little space in last month's column was the mention that 40 years ago, on 22 October 1953, Paul Wilson, W4HHK, and Tommy Thomas, W2UK, completed the first ever meteor contact on 2 meters. In June 1953, after a tropo contact between Paul and Ross, W4AO, fell apart, Paul continued to hear bursts of signals from Ross. Ross advised him that what he was hearing were meteor bursts. Subsequently (and coincidentally), Paul received correspondence from Tommy asking him if he was interested in running meteor skeds. Paul responded by citing the experience with Ross as an impetus to try to complete a contact.

Ed Tilton, W1HDQ, who was then editor of *QST*'s "World Above 50 Mc" column, indicated to the pair that meteor scatter conditions were best in the early morning hours. From that recommendation, they began daily early morning skeds. Over the next four months both operators heard bursts from each other. Recall that in those days they were running on CW and using analog readout equipment, which only approximated their frequencies, which made prospects for the completion a bit more difficult.

During the August *Perseids* they had a near miss. However, according to Paul, they did not exchange enough information for the League (read Tilton) to accept it as a legitimate contact. Keep in mind that they were pioneering this mode of propagation and there was not much established on any precedence for what was considered a legitimate QSO.

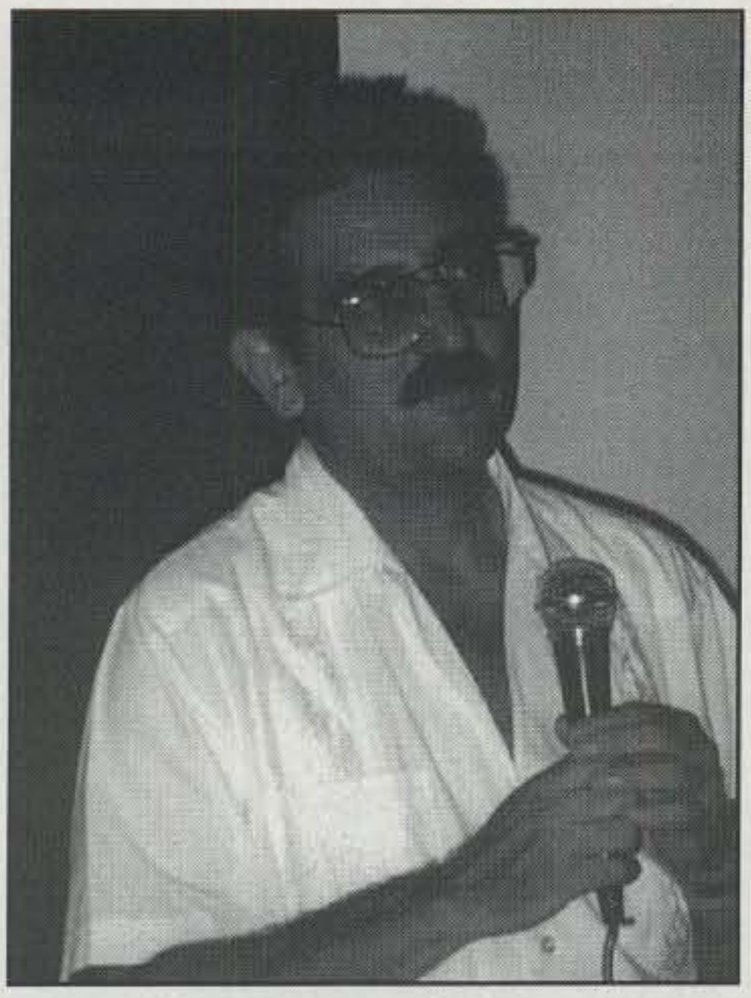
Finally, beginning at 0645 UTC, on 22 October, Paul began hearing bursts from Tommy. Over the next 45 minutes they exchanged enough information for the League to consider it a complete contact. (During the QSO time Paul sent Tommy a 339 and received a 449 from him.)

A subsequent phone call from Tommy confirmed that he had heard Paul with strong signals from time to time during the QSO period. Tommy reported to Paul that he first heard complete calls from him during a particularly long burst from an over dense burn. Subsequently, during the 45 minutes they ran, Tommy received his report and Paul's "R's," thereby putting them into the history book for this mode of propagation.

Now, for the irony. While they had some idea from reading Sky and Telescope what meteor showers were coming up, they did not have the benefit of computer modeling available today. Therefore, although they did not know it at the time, they were running their successful sked during one of the peak times of the *Orionids* meteor shower. According to Michael Owen, W9IP's meteor predicting software program, the most likely time for them to work was 0800 UTC, with a 94% probability of completion! Hum. Are there no accidents in history?

Where are these guys today? Paul contin-

Say You Saw It In CQ



Arnie Coro, CO2KK, held the audience spellbound at the Central States VHF conference in July, telling us about the accomplishments and the challenges facing Cuban amateurs. (Photo courtesy W3EP)

ues to perform pioneer work on the microwave bands, particularly EME on 2.3 GHz (and possibly soon on 3.4 GHz EME). At the CSVHF conference in July, Paul graciously provided me with copies of the logs of this contact for this write up.

Tommy retired from VHF+ work in 1965 following his return from Hawaii (where he, operating as KH6UK, and, along with John Chambers, W6NLZ, pioneered the California to Hawaii VHF+ duct contacts). Tommy is now active on HF using a pair of 210's in a self-oscillation setup. He can be found participating in the Antique Wireless Association QSO parties. Tommy will turn 90 years old on 22 December. If you think of it, drop him a QSL/birthday card to his *Callbook* address thanking him for all his pioneer work.

Current Contest

The second weekend of the ARRL EME contest is scheduled for 6–7 November. See last month's column and September *QST* for complete details. *Note:* This month the Algonquin Observatory will be operating on 432 MHz and 1296 MHz. As previously announced, their plans are to operate on Saturday on 432.050 MHz and listen between 432.050 and 432.060 MHz. On Sunday they will transmit on 1296.050 MHz and they will listen between 1296.050 and 1296.060 MHz. They will again maintain a liaison station on 14.345 MHz during the day and either 3.818 or 3.843 MHz during the night over both weekends.

On The Air

Roger Webb, WB4WTC, reports the following: On 4 July he worked VE1MQ and heard HI8DAF, and XE3EB. On 5 July he heard CO2KK, ZF1RC, ZF1DC, and HH2PK. On 6 July he worked KG4CB, and CT3FT. He heard

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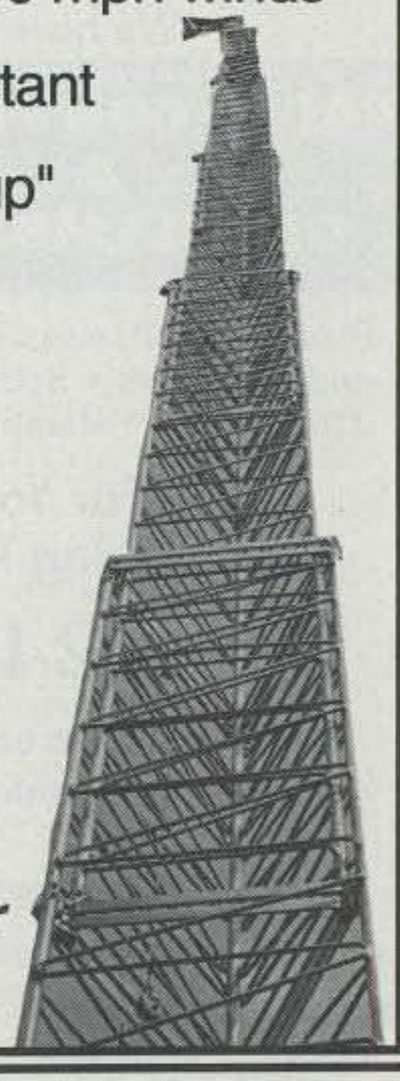

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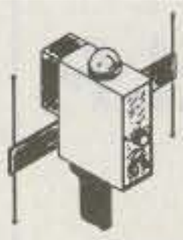

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CIRCLE 137 ON READER SERVICE CARD

ZF2QR, HI8DAF, CU1EZ, 6Y5IC, CO2KK, and HH2MK. On 7 July he worked HH2MK and heard VE1MQ and VE2TH. On 9 July he worked VE7XF and ZF2QR. On 11 July he worked HH2PK, VE3EEI, VY2ZZ, and XE3WMA. He heard the OX3VHF beacon. On 18 July he worked EH7CD, EH7BVD, and CT4KQ. He heard the CTØWW beacon and ZF1DC. On 28 July he heard ZF1DC. On 2 August he heard HH7PV and 6Y5IC. On 4 August he heard VE3s. On 10 August he worked VE4ZK. On 12 August he worked CM2JG (a new 6 meter op in Cuba). On 18 August he worked W6s. On 5 September he worked LU8EEM and LU6DLB. He heard HI8DAF and HH2PK. On 6 September he worked CO2LP and heard HH7PV, CM2PL, and CM2JG. Not a bad summer!

Chip Taylor, W1AIM, in Vermont, reports that on 6 meters, between 12 May and 26 July, he worked 33 states and eight countries, including country numbers 84, 85, and 86. *(I wish that Oklahoma was on your list, because Vermont is my last one.—ed.)* Chip also states that he is looking for a QSL route for HI8DAF.

Shep Shepard, W7HAH, reports that on 17 August he worked VE1PZ on 2 meters aurora.

Mike Staal, K6MYC, reports that I5MXX is now on 6 meters EME. On 14 August Jimmy Treybig, W6JKV, and Bob Magnani, K6QXY, worked him. Then on 16 August Mike worked him. Finally, on 18 August Fred, W5FF, and Lee Fish, K5FF worked him. Mike reports that it is possible to hear your own echoes with an array as small as four 7-element Yagis. Look for more activity on the moon, including possibly the Jicamarca Radar Observatory in Peru. More on that story as it develops

Doug Allen, W2CRS, reports that he and **Ron Galbraith, KDØDW,** made 47 QSOs from Sierra Grande peak near Des Moines, New Mexico during the August UHF contest.

Wayne King, N2WK, reports that his QTH and Dave Hallidy, KD5RO's call were used during the UHF contest to score a record-breaking entry. Wayne reports that in most of the bands they beat out their arch rival W2SZ. Look for the results of this contest to appear next spring.

Dave Meacham, W6EMD, reports that he is on 6 and 2 meters and 70 cm terrestrial and will soon be on 70 cm EME on his moonrise.

Carl Smith, AA4H, from grid square EM86, is somewhat new to the VHF+ frequencies. He is quite active on 6 and 2 meters and is set up for 222 MHz, as well. He wonders, however, where all the activity is on this band. Part of the problem, Carl, has been the uncertainty of the future of the band. However, that is no longer an excuse. How should we generate activity on the only exclusively amateur band on the VHF+ frequencies? Carl is looking to work you. You can contact him at 5971 Hwy 126, Blountville, TN 37617.

Chris Linck, N2NEH, in Troy, NY, reports that after just completing the installation of his homebrew 1/4λ (wavelength) vertical dipole, he announced his call on 52.525 MHz. He was immediately answered by Don, VE3KUZ, in Thunder Bay. Don's signal was so loud that Chris linked it into the local 2 meter/70 cm repeater system and immediately created a pileup. Hope to work you from here next summer, Chris.

John, N2NEP, reports that he had an excellent sporadic E opening on 2 meters on 6 June. Among the stations he worked were: WD5EWD (EM22), KJ5AG (EM34), WA5JCI (EM21), KE8FD (EM89), WB5PJL (EM23), KI5UA (EM22), AAA5C (EM13), N5FAC (EM35), WD5DJT (EM12), VE3AJY (FN03), WQ5S (EM13), WT7G (EM12), NM5M (EM13), W5TKB (EM13), W5RID (EM12), N5ZSB (EM25), and WD5FEN (EM14). Looks like you worked all of Dallas and most of Oklahoma, John.

Bob Daniel, N9OZM, reports that at around 0025 UTC on 21 July he had a sporadic E opening on 2 meters. Stations worked included: NW3C (EN90), KA3SDP (FN00), N8OBD (EN81), N8TLZ (FM09), WA3HQK (FM09), N4DUE(EM78), and KB4EBP (EM78).

Frank, AA2DR, reported that a number of stations as far north as New England and as far south as South Carolina experienced a very good tropo opening ahead of the hurricane in late August. Signals were very intense and at times well over S9.

Mike Cherry, VE7SKA, reported that there are around ten regulars on from Vancouver, BC area (CN89). He stated that CN88 is divided between the islands of the southwest part of BC and northwest Washington state. On the VE side he, VE7KRC, and VE7BG are active. He also stated that VE7XO is active from CN79. He reported that the first signs of sporadic E propagation showed up around 28 April, when he started hearing the WD7Z beacon (in Arizona). During the course of the summer he worked as far east as Vermont, Virginia, and North Carolina. The highlight seemed to be on 14 July, when at one point nine different beacons from around the country were being copied at once. Mike commented that long-haul sporadic E may not always be "double hop," but sometimes it could be a sort of sporadic E ducting. He has observed that sometimes there are no intermediate footprints between landing zones of long-haul sporadic E.

This brings to mind the QSO that Mark Hoffman, KA2RDO, had with Tom Corbitt, NL7OW. Mark calculated several hops to get from his QTH to Tom's. However, one of the landing zones should have been in Alberta. No one was on, however. Was it because the signal never touched down, or was it because the hour was so late? Or was it that the signal skirted the auroral zone and got caught in a duct? What's your answer?

Al Ward, WB5LUA, reported that with working Jack, WB4EFZ (EM94), in South Carolina on 4 June, he has now worked 34 states on 1296 MHz. Al stated that the contact came as a bit of a surprise to him, considering Jack's 432 MHz signal was not very good and he was only running 16 watts on 1296 MHz. Al also reports excellent tropo conditions during those early June days, with lots of 4-land stations being worked on 2 meters and 125 and 70 cm.

Arnie Coro, CO2KK A Wrap-Up Report

As reported last month, Arnie Coro, CO2KK, was a guest of the Central States VHF Society for their annual conference. Following the conference Arnie was a guest of Lauren Libby, KXØO, who took him to Colorado Springs for a couple of days of rest and relaxation. While there, Arnie toured a couple of commercial broadcast stations.

He then returned to Oklahoma City, where he was a guest of Jay Liebmann, K5JL, and his lovely wife, Carol. At the end of the week I took him out to Drumright to visit my fiancee,

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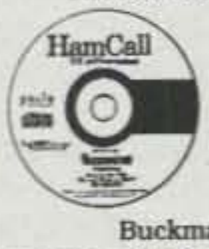

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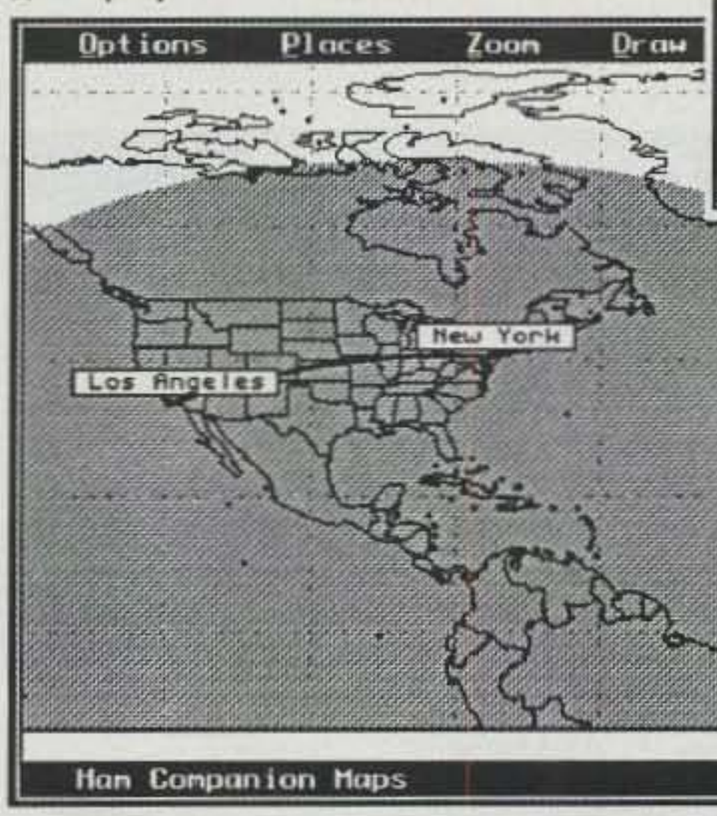

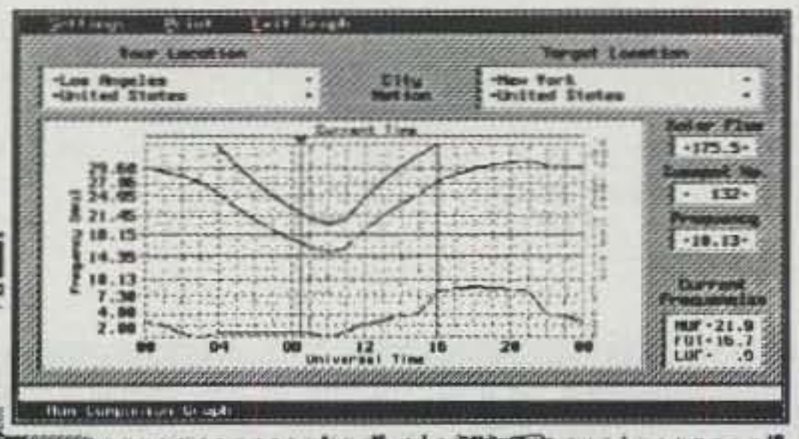

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Carol King, K5CPZ's parents and to see what a small town in America is like. While there he visited a Rotary meeting and was presented with a banner from the club. He announced that he would present the banner to his mother upon his return to Cuba. He said that it would bring back fond memories for her, as Rotary has died out since the Revolution.

Later that afternoon Carol, Arnie, and I went to Tulsa to tour the city and meet Carol's brother, Don, at the radio station, where he is a radio personality on a sports talk show. Don invited Arnie to be interviewed on the early evening (drive time) program. Arnie agreed, and it proved to be a very interesting hour-long show where we learned much about sports and athletic activities in Cuba.

On Monday morning Larry Hazelwood, W5NZS, and I saw Arnie off at the airport where he caught his plane to Connecticut. For the next week he was a guest of Emil Pocock, W3EP, *QST*'s VHF editor. During the week he visited ARRL headquarters and met with Executive Vice President Dave Sumner, K1ZZ, for over three hours. He also met with Contest Department head Billy Lunt, KR1R, who told him just how well the Cuban team did during the June ARRL VHF QSO Party. (I know, but I am not going to tell, and this is one time that I will tell you that you will have to wait to read it next month in *QST*.) At the end of the week Arnie attended the East Coast VHF conference and was their guest speaker at their banquet.

On the following Monday Arnie flew to Tampa to meet with some friends of his at a broadcast station. Later in the week he went to Miami. On Friday 20 August Arnie boarded a charter plane back to Havana.

Arnie received a lot of help from fellow amateurs here in the U.S. He hopes to put his new equipment to use to have more activity on 6 and 2 meters and to have new activity on 70 cm, and maybe eventually even on EME. He made many, many friends while here and did much to advance the good will between amateur radio operators in our two countries.

As a journalist, I qualify for one of the few exemptions to the embargo to travel to Cuba. In a conversation I had with Arnie on the day before I wrote this column (11 September), I had a discussion about the possibility of going to Cuba during this month (November). If I do, it will be to operate some 6 meters and to participate in the CQ WW DX CW Contest. I will report on my activities in this column should my trip materialize.

News of VHF+ Publications

DUBUS is an excellent quarterly magazine that has been around for over twenty years. The magazine is well known in Europe for its technical articles and information pertaining to VHF and above activities over there. Many of the articles are printed in German and English for the bilingual reader. If you are interested in subscribing, contact U.S. subscription agent Russ Miller, N7ART, 12041 S.W. Peninsula Dr., Crooked River Ranch, OR 97760, or call 503-548-1221. The subscription rate is $25.00 per year. When you send Russ your check, the magazine, which is published in Germany, will come from there to your mailbox.

John Carter, KØIFL, has retired the **"Terrestrial VHF+"** newsletter effective with the August issue. He will continue to publish the "2 Meter EME" newsletter (subscriptions are $12.00 per year for ten issues) and maintain a data base of VHF+ operators. He will make that list available to purchasers on a yet to be determined fee. The list will be available both on disk and in print. Contact him at his *Callbook* address for subscriptions to the EME newsletter or more information on the directory. Please include an SASE when you write.

The Rocky Mountain VHF+ Newsletter: Doug Allen, W2CRS, reports that a new newsletter, the "Rocky Mountain VHF+ Newsletter," has been started by him and Ron Galbraith, KDØDW. In order to subscribe, send 12 SASEs plus $5.00 to 14231 E. County Line Rd., Longmont, CO 80501. Doug also reports that Ron runs a KW at a real good location and has been instrumental in stirring up VHF+ activity in the Rocky Mountain area. Additionally, Doug says that between 15 and 20 operators check into the SWOT net every Monday night at 8 PM local time on 144.220 MHz.

50 MHz DX Bulletin Still Alive and Pretty Well: I had a very nice long visit with Victor Frank, K6FV, the new editor of the "50 MHz DX Bulletin" while we were both at the W6JKV barbeque. Victor indicated that he is considering making a go with the "Bulletin." Victor does express some concern, however, about the availability of news during the so called "lean years" of the lull in the sunspot activity. Nevertheless, he will forge ahead with whatever news he has to report. If you are interested in subscribing, send Victor an SASE at 12450 Skyline Blvd., Woodside, CA 94062-4541.

The SMART VHF'er: The sponsor of the SMART Net—which stands for Six Meter Amateur Radio Turkeys and meets each Sunday night at 9 PM CT on 50.130 MHz—Ken Benton, K4FHQ, puts out a "smart" little two-page newsletter. It is available for a nominal charge to anyone who checks into the SMART net. If you are interested in associating with a great bunch of guys in and around Alabama, then check into their net!

N.E.W.S. Letter: Appropriately named for its organization, the North East Weak Signal Group, and as a self-description, the "N.E.W.S. Letter" has recently begun publication. Published by the newly formed N.E.W.S. Group, which is an outgrowth of this year's East Coast VHF conference, this newsletter reports on weak signal activity, principally in the New England area. If you are interested in membership, you can join this year for free (you can't beat that deal!). Subsequent year's membership will cost $10.00. For your membership application, send an SASE to Ron Klimas, WZ1V, 458 Allentown Road, Bristol, CT 06010.

4U1UN QSL Route Correction

In the September column we reported that Carmello, AA2FN, has all the logs for the last 1½ years. However, he called me to report that he is not the QSL manager. He states that cards should continue to go to W8CZN at his *Callbook* address. We apologize for overloading your mailbox, Carmello.

And Finally

My Mailbox: Speaking of mailboxes, you are doing a great job of filling mine with your reports. I am particularly appreciative of Bob Gorardi, N9LAG, who came through with a copy of the "6 Meters, the Magic Band" report. I really appreciate your taking the time, Bob.

Occasionally some of you will send reports directly to *CQ*. While I don't mind that, I want to discourage that route. You see, they are so busy at headquarters with handling all the new subscriptions to the magazine this column has generated that they can only forward mail to me once a month. So if you mail your letter at just the right (wrong) time, it might not get to me for a whole month. *The solution:* Send your mail to my P.O. Box listed at the beginning of this column. Better yet, if you have a FAX machine, FAX it to me at 405-528-0746, or if you are on CompuServe, send me your E-mail message. My account number is 72124,2734. Through Internet just about anyone can send E-mail to anyone (for a small fee, of course).

Additionally, you can always call me at 405-528-6625. If I am in, I will visit with you. If not, you can leave a message on the answering machine and if lightning doesn't strike and wipe out the messages as it did with Greg Poel, KC8P, then I will call you back.

My appreciation goes to all of you who send me your news and newsletters. I am beginning to be flooded with mail. In fact, now, it is a disappointment to go to the post office and find nothing! Thanks also to Bob, KA2DRH, who constantly FAXes me copies of the Southeast Packet cluster spotting files.

Keep your correspondence coming. And I will keep writing about your great activities. Until next month . . .

73, Joe, N6CL

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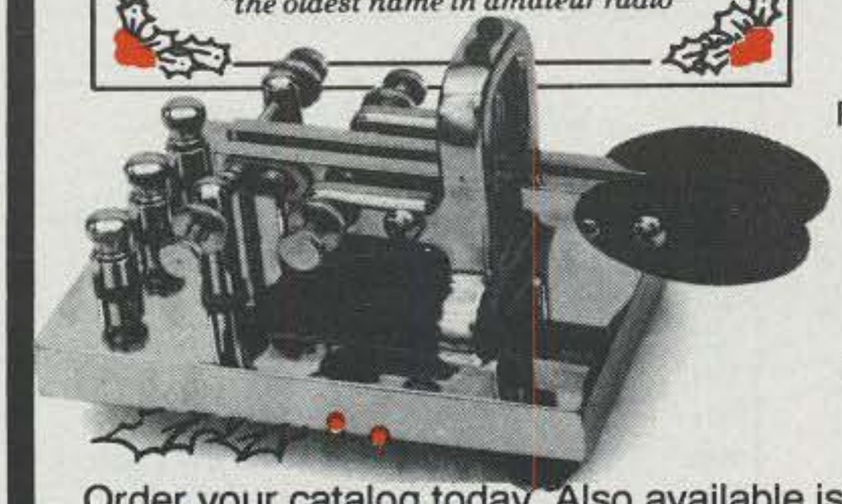

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CONTEST CALENDAR

BY JOHN DORR, K1AR

NEWS/VIEWS OF ON-THE-AIR COMPETITION

The Impact of Packet Radio on Contesting

I have been (and still am) a strong supporter of the use of packet radio spotting in contesting. The experience of being involved with Dick Newell, AK1A's initial PacketCluster™ releases is still vivid in my mind.

Let's begin this month with a little history of PacketCluster. By his own admission, AK1A never envisioned the pervasive impact his PacketCluster software would have on DXing and contesting—not only in the United States (now over 40 states have active nodes), but in 33 countries around the world by last count. You may be surprised to learn that there are now over 500 nodes around the world providing a service that we have long since taken for granted.

PacketCluster had its beginnings in 1986 as a multi-user bulletin board. Dick called it the "Packet Conference Board System." In those days most packet radio systems were limited to single users. AK1A developed the multi-user idea as a way for Yankee Clipper Contest Club members to better communicate with each other given their varied geographical locations. Believe it or not, the addition of DX spotting was an afterthought! The limitation of Dick's first product was that he could only support 26 simultaneous users. By designing a network protocol, host node systems could be linked together, forming the basis for the massive cluster networks that we enjoy today.

The 1986 CQ World-Wide DX Contest was the first test for PacketCluster. Over the course of the weekend there were approximately 300 spots and nearly the same number of computer restarts. When compared to a typical DX spot count of 3 to 4 thousand announcements today by 500-plus users over 30 nodes in New England, times have certainly changed.

The first "non-YCCC" installations were N2FB and W8ZF, both in the spring of 1987. Dick recalls the telephone "bug-report" traffic on the Monday and Tuesday after a contest in those days, and this was while he was attempting to maintain his regular day job.

It's important to point out to contest beginners that the concept of contest spotting is not new. Many of you who have been involved in contesting for a few decades will recall the days of 2 meter VHF spotting. The voice announcements and never-ending requests for repeats have long since been replaced by entering "sh/dx/10" commands on our keyboards. However, 2 meters was an equally important operating tool to the multi-op stations of that era.

What has changed is the impact that packet networks have had on contesting when compared to the old days of 2 meter voice spotting. In those days a single operator who chose to use 2 meter voice was simply classified as a multi-operator station and placed together with the three to ten-plus person multi-single teams. It was a tool whose popularity did not come close to that of packet today. In the late '80s packet radio grew into such an important aspect of contesting that it earned its own category, Single Operator Assisted, in many major contests. Stations were then able to compete head-to-head with each other and not be buried at the bottom of the multi-operator scores. In the 1992 CQ WW Contest results, for example, there were over 400 entries in the Single Operator Assisted category alone. If you are interested, you may want to dig out my February '91 column, which discussed packet spotting statistics in more length.

So has all of this change been for the good? I'm sure that if you have operated from a small station and been trapped in what we now call "packet pileups," you must wonder. Recently on the Internet Contest Reflector I read a message from a guy who was pointing out the effects of packet spotting on the little pistol. In his view, users of small stations are finding it harder and harder to break through packet-generated pileups. Anyone who has operated from the "other side" can attest to the instant pileups that come from the formula of: spot the DX, add water, and stir. The difference for the small station today is that his window of opportunity has shrunk when the wolves find a juicy multiplier and spot it across scores of packet nodes around the country.

Let's take a look, however, at some of the benefits. There's no doubt that packet spotting, as with most other contest technologies, has made contesting more fun for those who use it. One of the old axioms of contesting is that the single operator category can be very lonely. Unfortunately, not all of us have the capability of supporting a multi-operation effort from our own stations. In fact, many of us would not want to put one together even if we had the time and facilities. The Assisted category gives you another option. Now you can talk to your friends and operate at the same time! You have opened a window to hundreds of competitors who are operating with similar goals to yours.

Second, the possibilities that come from additional ears finding interesting multipliers for you to work can make the contest more exciting. Remember, not every packet spot results in a "monster" pileup. Having operated this category several times myself, I can attest to the enjoyment one can get from the mix of running stations and tuning for packet spots.

Finally, if your station has advanced to the stage of computer-controlled transceivers (e.g., TS950, FT1000, IC765, etc.) you have tremendous resources at your fingertips with the combination of packet spotting, computer logging, and ease of jumping in and working good multipliers.

Of course nothing is perfect, and as we've discussed , the availability of pack-

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Calendar of Events

Oct.	27–29	YLRL SSB Anniversary Party
Oct.	**30–31**	**CQ World-Wide SSB Contest**
Nov.	6–8	ARRL CW Sweepstakes
Nov.	12–14	Japan International DX Contest
Nov.	13–14	Worked All Europe RTTY Contest
Nov.	20–21	Ukrainian DX Contest
Nov.	20–22	ARRL SSB Sweepstakes
Nov.	**27–28**	**CQ World-Wide CW Contest**
Dec.	3–5	ARRL 160 Meter Contest
Dec.	11–12	ARRL 10 Meter Contest
Dec.	31	ARRL Straight Key Night
Jan.	**28–30**	**CQ WW 160 Meter CW Contest**

November's Contest Tip

Maybe this is an idea that David Letterman (U.S. TV talkshow host) stole from me. For years, before every contest, I compiled a "Top-10" list of strategies/events that I executed well and those which needed improvement based on the previous year's contest. What's different is that I have begun saving them, compiling a multi-year set of lists. The "well-executed" list can be a source of encouragement, while the areas needing improvement give you something to shoot for each time you operate. This technique can only improve your score!

Say You Saw It In CQ

et radio is not without some amount of criticism in contesting circles. However, on balance, it's a great way to operate a contest. Maybe you'll want to give it a try in the next one.

Final Thoughts

I appreciate the *CQ* Contest Survey (September 1993 Contest Calendar) responses you have been sending in. It's not too late to submit your response, so take a few moments and cast your votes.

As always, please remember that the deadline for the February issue is December 1st.

73, John, K1AR

Japan International DX Contest

2300Z Fri. to 2300Z Sun. Nov. 12–14

This is the 6th year for the Japan International DX Contest organized by the *Japanese Five Nine Magazine*. It's the JAs working the world on SSB only, all five bands, 10–80 meters (no WARC bands).

Classes: Single operator, single and all band, multi-operator all band only. Non-JA single operators are limited to 30 hours out of the 48-hour contest period. Off periods of at least 60 minutes must be clearly indicated in the log. Multi-operators can operate the full 48 hours. Stations must remain on the same band for at least 10 minutes before changing bands.

Exchange: Two points for 80 meter QSOs, 1 point for 40–15 meters, 2 points for 10 meters.

Multiplier: Total number of JA Prefectures, plus #48 JD1 Ogasawara Is., #49 JD1 Okino-Torishma Is., and #50 JD1 Minami-Torishma Is. (maximum of 50 per band).

Final Score: Total QSO points from all bands times the sum of the multiplier from each band.

Awards: Certificates to the top scorers in each class in proportion to the number of entries from each country and each call area in the U.S. and Japan. Plaques to the continental winners in each class single and multi-operators. Stations working all JA Prefectures (1–47) during the contest can request a special award with their entry.

Use a separate sheet for each band. Indicate the multiplier in a separate column only the first time it is worked on each band. Entries with more than 500 contacts must include a dupe sheet. There are the usual penalties for taking credit for duplicate contacts, and more than 2% means disqualification.

Mailing deadline is December 31st to *Five-Nine Magazine*, Japan International DX Contest, P.O. Box 59, Kamata, Tokyo 144, Japan. Entrants may receive the final results by enclosing one IRC and an SAE.

ARRL Sweepstakes

CW: Nov. 6–8 Phone: Nov. 20–22
2100Z Sat., to 0300Z Mon.

This is the 60th running of the Sweepstakes, making it the oldest domestic competition going, and it really stirs up a lot of activity.

Operation is limited to stations in ARRL sections. Operating periods are restricted to a maximum of 24 out of the 30 hour contest period. Times off may not be less than 30 minutes and must be clearly indicated in your log.

In order to minimize QRM to non-contesters it is recommended that operation be confirmed to certain portions of the bands. It is recommended that you check *QST* for details.

There are several other regulations, including a cross-check sheet if you make 200 or more contacts. A large SASE (45 cents postage) will get you the "SS Package" and Operating Aid #6 with enough log and summary sheets for an average outing.

Exchange: QSO number, power class, call, last two digits of year first licensed, and your ARRL section. Stations using 150 watts or less are classed *A*, over 150 watts *B*, and QRP *Q*. The same station may be worked only once, regardless of the band.

Scoring: Each completed QSO is worth 2 points. The multiplier is derived from the number of ARRL sections.

Awards: The usual certificates in each class and mode for single operator stations in each section and multi-operator stations in each division.

Last year's trophy program has been expanded. Check October *QST* for details. In addition, taking off on last year's highly successful program, the ARRL will be offering SS pins to participants with 100 QSOs or more (cost is $3 pp.). In addition, SS coffee mugs will be made available to participants achieving a "clean sweep" ($8 pp.).

Logs must be postmarked no later than 30 days after the contest and go to: ARRL Communications Dept., 225 Main Street, Newington, CT 06111.

European RTTY Contest

1200Z Sat. to 2400Z Sun., Nov. 13–14

Rules for the WAEDC RTTY contest are mostly the same as for the CW and Phone sections held in August and September. There is one main difference, however. To generate more activity and increase the QSO points, contacts with stations worldwide are permitted. QTC traffic, however, is not permitted within your own continent. Check the August Calendar for detailed rules and regulations.

Exchange: RST plus a progressive QSO number.

Points: Each QSO and each QTC ex-

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Contest Errata

1992 CQ WW SSB Contest

AK3Z was incorrectly listed as a Single Operator. The score should be classified as Multi-Single, AK3Z and K2PH ops.

1992 CQ WW CW Contest

VY2SS was erroneously listed as a 21 MHz entry. The correct category should have been on 3.5 MHz.

1992 CQ WPX Contest

N4WW was placed in the wrong category. N4WW should be listed as a Multi-Multi entry. WC4E is the USA Multi-Single winner and N4WW is the USA Multi-Multi winner.

IT9TQH was listed incorrectly. The correct entry should be II9ITU operated by IT9TQH.

YT3EW was omitted from the score listings for Slovenia.

1992 CQ WPX Contest Records

The correct Multi-Single SSB Europe record holder is IJ4R ('91) with a score of 16,027,956.

The correct Single Operator, 7 MHz SSB USA record holder is KC7EM ('92) with a score of 1,396,646.

HG73DX should be the World Multi-Multi CW record holder ('91) with a score of 16,468,480.

changed are worth 1 point. QTCs may be sent/received worldwide between continents (limit 10).

Multiplier: Multipliers are determined from the DXCC list.

Bonus Multiplier: Multiply your multiplier on 80 meters by 4, on 40 meters by 3, and on 10/15/20 meters by 2.

Awards: Certificates will be awarded to the highest scorers in each country with a reasonable score. Continental leaders will receive a plaque. Certificates will also be awarded to stations with at least half the score of the continental leader.

It is suggested that you use the official DARC log forms. A large SASE (IRCs) to the address below will get you a supply.

Mailing deadline for all entries is December 15th to: WAEDC Contest Committee, Postbox 1328, D-8950 Kaufbeuren, Germany.

Ukrainian DX Contest

1200Z Sat. to 1200Z Sun., Nov. 20–21

This one is co-sponsored by the Ukrainian Amateur Radio League and the Ukrainian Contest Club and is open to amateurs around the world.

Classes: Single Operator, All Band and Single Band, Multi-Single, Multi-Multi, Single Operator QRP All Band/Single Band, and SWL.

Exchange: RS(T) plus serial number (599001). Ukrainian stations will add a two-letter abbreviation representing their region.

Scoring: Credit 1 point for QSOs within your country, 2 points within your own continent, 3 points outside your continent, and 10 points for QSOs with the Ukraine. Multipliers are the sum of DXCC, WAE, and Ukrainian regions per band.

Final Score: Final score is calculated by multiplying total QSO points by the total multiplier.

Awards: First-place certificates will be awarded for each category and country.

Logs are to be postmarked no later than 30 days after the contest and should be sent to: Ukrainian Contest Club, P.O. Box 4850, Zaporozhye, 330118, Ukraine.

CQ WW DX CW Contest

0000Z Sat. to 2400Z Sun., Nov. 27–28

Just a reminder: The CW section of *CQ*'s WW DX Contest is coming up the last weekend of this month. The phone section, of course, is history. Complete rules were published in the September issue, with trophies.

All logs, both Phone and CW, must be sent to *CQ* headquarters: CQ World-Wide DX Contest, 76 North Broadway, Hicksville, NY 11801 USA.

Deadline for logs for the Phone section is December 1st, and January 15th for the CW section. Be sure to indicate Phone or CW on your envelope.

ARRL 160 Meter CW Contest

2200Z Fri. to 1600Z Sun., Dec. 3–5

This is the 24th year for this "Top Band" activity. Exchange is between US stateside, VE, and DX stations. DX to DX is not permitted for contest credit.

Classes: Single operator, high, low, and QRP; and multi-operator single transmitter.

Exchange: RST and ARRL section for W/VE. RST only for DX stations; ITU Region for maritime and aeronautical mobiles.

Scoring: Contacts between stations in ARRL sections count as 2 points, with DX stations 5 points.

Multiplier: Determined by number of ARRL sections and DX countries worked (for W/VE). DX use ARRL sections only.

Final Score: Total QSO points times ARRL section and DX country multiplier.

Awards: Certificates to the top-scoring single operator station in each ARRL section and DXCC country. And to the top-scoring multi-operator station in each ARRL Division and continent.

Indicate the multiplier in a separate column only the first time it is worked. Entries with 200 or more QSOs are required to include a dupe sheet. Official log forms are recommended and are available from the ARRL. A large SASE and 45 cents postage or 2 IRCs will get you a supply for more than 300 contacts.

The usual grounds for disqualification (violation of established rules, excessive duplicate contacts, etc.) will prevail.

Mailing deadline for logs is January 6th to: ARRL Communications Dept., 160 Contest, 225 Main Street, Newington, CT 06111.

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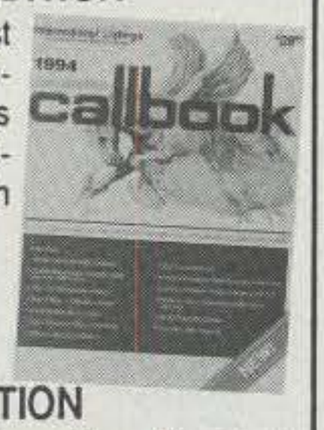

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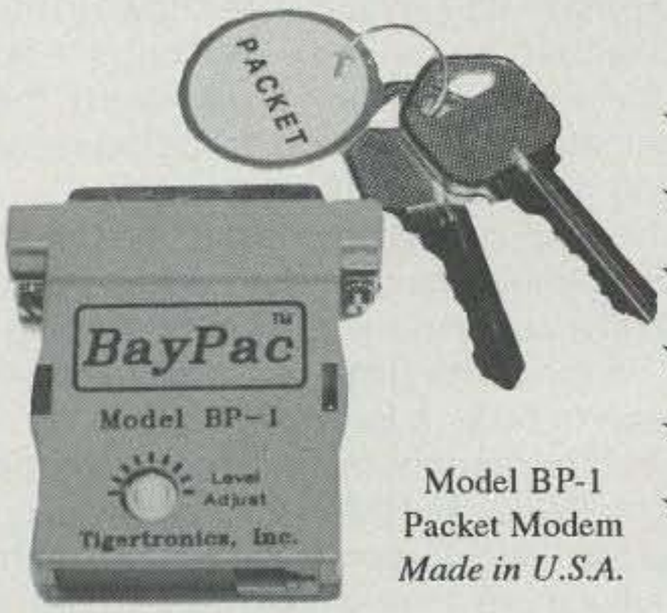

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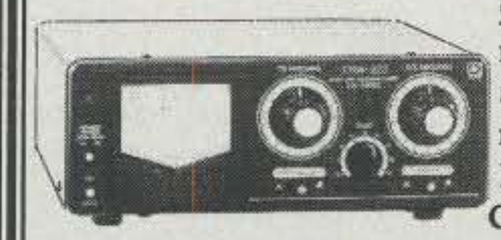

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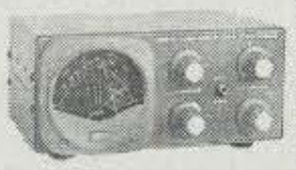

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PACKET USER'S NOTEBOOK

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

BY BUCK ROGERS, K4ABT

A Deviation Meter For TheNet X-1J Node

Before we get into the "meat" of this month's column, I wish to apologize for the delay in response to many requests, with disks, for information and drawings that relate to the X-1J software. I did mail the disks and drawings immediately upon receiving the disks and SASEs sent. The problem was not at my QTH. The problem was with the U.S. Postal Service.

I mailed the disks in the letter-type (#10) envelopes I received from many readers. The letters had the correct amount of postage affixed, and the disks were well protected by the addition of the two inch wide tape I used to prevent puncture of the envelope. It appears that some misguided postal employees at the Lynchburg post office saw fit to cancel all the postage on the letters, paste a label across the address on the letters, and return them to me—a week later. The only explanation provided was a note which read: "Return to sender. Odd shaped objects inside letter-size envelopes are not allowed; DMM 124.47." The reference to DMM 124.47 is not clear at this writing, as I have tried many times to contact the local Lynchburg postmaster to get some kind of explanation for the manner in which this mail is being handled, but to no avail. I'm not sure what all this means, but I can assure you that I do not send dangerous devices in the mail.

No, I'm not bashing every postal clerk in the nation—only those who caused me to spend valuable money, time, and effort purchasing new postage and larger envelopes to do the same thing that would have been handled easily otherwise. I feel as though we paid for a service that we never received. There was no reason for this problem to occur.

Please remember this episode, as I can only modify my earlier set of rules regarding requests for the X-1 disks and drawings (see the requirements later in this column), and ask you to send a 9 × 12 inch envelope, along with the other requirements outlined.

Thanks, WB4BIS

I often receive requests from packeteers for a means to interface a transceiver that I've not had the chance to use or build.

211 Luenburg Drive, Evington, VA 24550

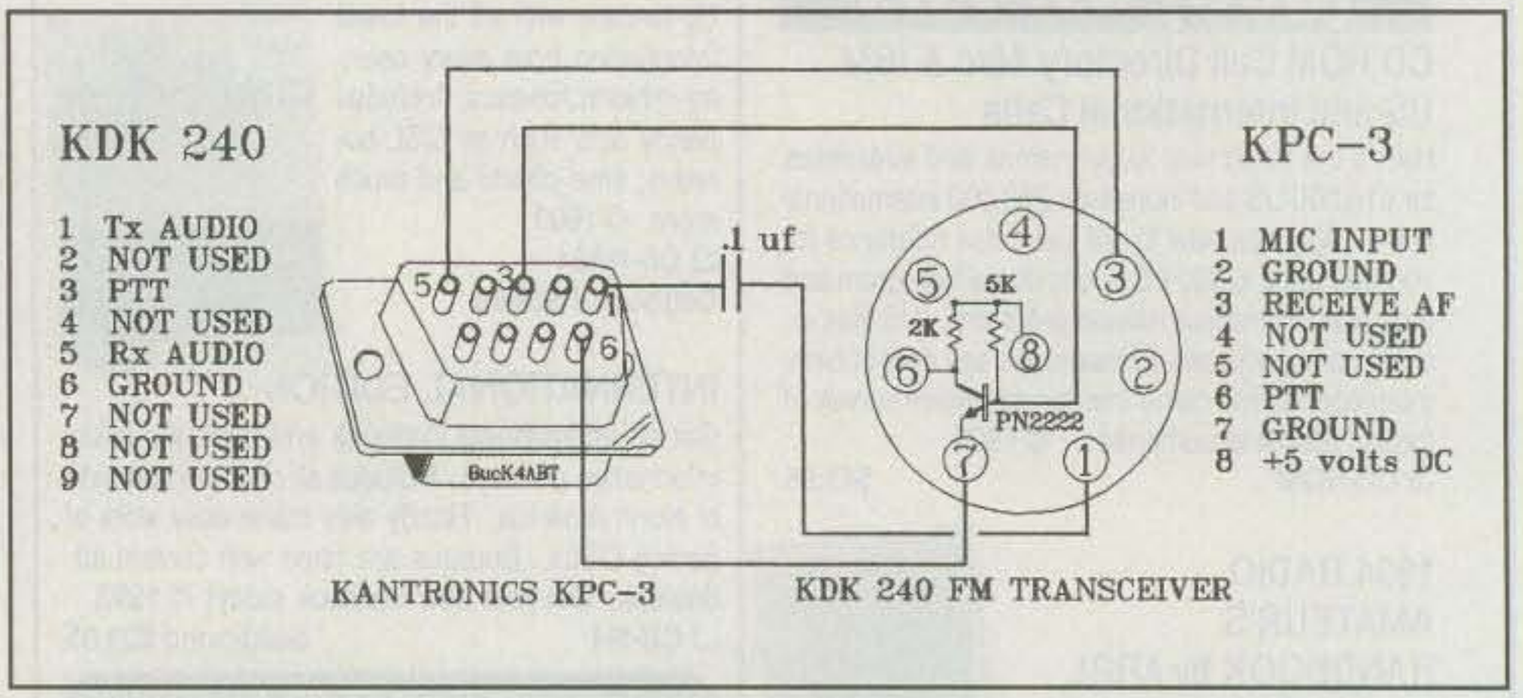


Fig. 1- The circuit shown here was devised by WD4BIS to interface the Kantronics KDK240 uses +5 volts DC to activate PTT rather than ground. Gerald used this circuit to polarity of the PTTY line in the KDK 240.

However, if I haven't tried it, then I'm reluctant to print it here.

The interface I'm about to describe was sent in by Gerald S. Crenshaw (WD4BIS, Garland, Texas), who explained how he interfaced a KPC-3 and the KDK 240 for use on field day. Gerald goes on to say that he used this interface nonstop during the entire field exercise with no problem during the entire period. Having said that, I took him at his word, and I'm passing the text and drawing along to the readers of this column in the event some other KDK 240 owners might need to interface a KDK to a KPC. Fig. 1 will provide the rest of the details for the KDK 240 to KPC-3 interface.

Gerald mentioned that he had constructed the circuit with the components inside the connector. I would make sure that all resistors were small, in the area of 1/8 watt size. Gerald points out that the PN2222 plastic-case transistor serves better in the close space than a metal-case 2N2222. Notice the .1 uFd coupling capacitor in the AFSK line for isolation.

The Finishing Touch

There are times when I find there is not enough room in my column to say everything that needs to be said. Then there are other times when I realize I have left some loose ends. This month I'm not just going to "touch" on one of these subjects. I'm going to cover the final chapter of it.

In the August and September columns I discussed the TheNet X-1J node. In August I covered most of the SYSOP configuration and implementation of the X-1J node. Then in September I completed the SYSOP level and covered the user documentation of the X-1J node.

I mentioned the use of the analog to digital converter, which enables the users to read their transceiver packet deviation from the X-1J node when the node is equipped with the hardware shown in the September column. I covered only the tip of the iceberg when I displayed the schematic of the analog to digital measuring hardware for the X-1J node.

The response to that column has been nothing short of astounding. The amount of mail arriving at my QTH here in Evington, Virginia has given the postal carrier reason to order a larger vehicle!

Several readers sent requests for the X-1J software, but they sent no disk, or no postage, and in some cases they sent nothing more than a note requesting a disk of the X-1J software. I am again going to restate the text I used earlier in the August and September columns.

I will supply the files, but *only if the following conditions are met!*

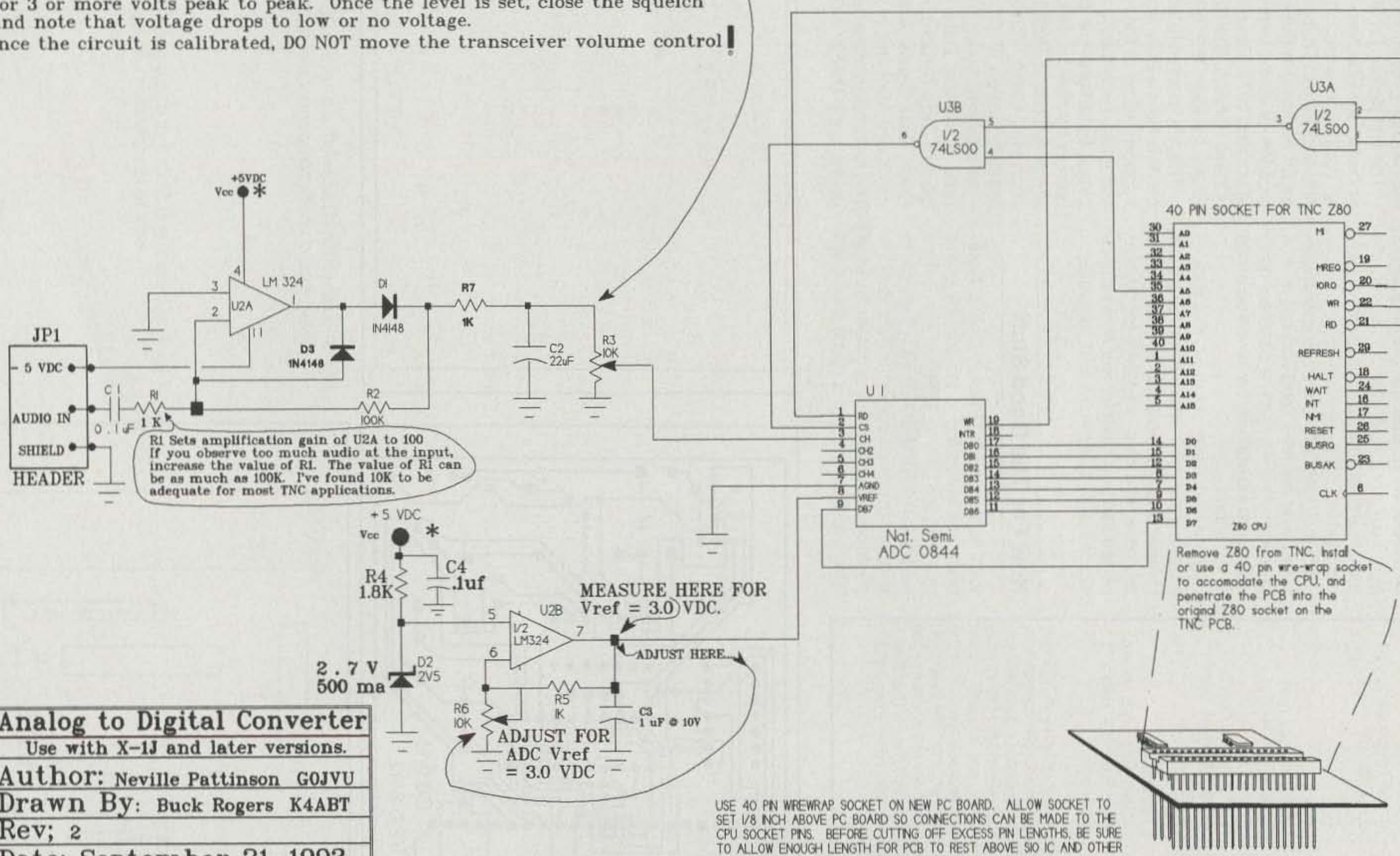
1. YOU supply the disk FORMATTED (MS/DOS), 3.5 or 5.25 inch.

2. YOU supply a PRE-ADDRESSED, and POSTAGE PAID, LARGE (9 × 12) ENVELOPE.

I also include a set of drawings with the software. Therefore, it is necessary that enough postage be included to cover the

Say You Saw It In CQ

Open squelch and use "white noise" to set the the voltage at this point for 3 or more volts peak to peak. Once the level is set, close the squelch and note that voltage drops to low or no voltage.
Once the circuit is calibrated, DO NOT move the transceiver volume control.



Analog to Digital Converter
Use with X-1J and later versions.
Author: Neville Pattinson G0JVU
Drawn By: Buck Rogers K4ABT
Rev; 2
Date: September 21, 1993

USE 40 PIN WIREWRAP SOCKET ON NEW PC BOARD. ALLOW SOCKET TO SET 1/8 INCH ABOVE PC BOARD SO CONNECTIONS CAN BE MADE TO THE CPU SOCKET PINS. BEFORE CUTTING OFF EXCESS PIN LENGTHS, BE SURE TO ALLOW ENOUGH LENGTH FOR PCB TO REST ABOVE SIO IC AND OTHER COMPONENTS ON THE TNC CIRCUIT BOARD.

Fig. 2- Basic structure of the analog to digital converter.

Deviation Meter Parts List

Qty	Ref.	Part
2	C1, C3	1 uF @ 10V
1	C4	0.1 uF (decoupling cap.)
1	C2	22 uF @ 10V
1	R1	10K
2	R5, R7	1K
1	R4	1.8K
2	R3, R6	10K miniature pots
1	R2	100K
2	D1, D3	IN4148
1	D2	2V7 zener (250mW)
1	U1	ADC0844 (Nat. Semi.)*
1	U2	LM324
1	U3	74HC00
1	JP1	3 pin header
1	40 pin	40 pin wire-wrap socket
1	PCB	(See figs. 3, 4, and 5**)
1	X-1J	Software

**The ADC0844 is a four-channel ADC available from most large mail-order companies. **The complete printed circuit board, already assembled, is available from MFJ Enterprises Inc. The assembly includes all parts shown in the list. The assembly does not include the X-1J EPROM or the Z-80 CPU. The Z-80 CPU is the CPU extracted from the socket of the TNC-2 or clone into which the PCB is inserted. The price of the assembly from MFJ is $29.95.*

weight of the disk you supply and four sheets of standard paper. If you include enough postage on the large (manilla) envelope, I'll include the drawing package. *I will not format disks, I do not add the return address, and I do not supply postage!*

My mail load is large, so please understand why my time (and money) is at a premium. And if I seem a bit terse, don't admonish me until you have walked a mile in my shoes.

Once you have obtained the disk of zipped files, you should first read the Overview documentation text file. There are other text files, and they too should be read so you have a clear understanding of the X-1J software and firmware.

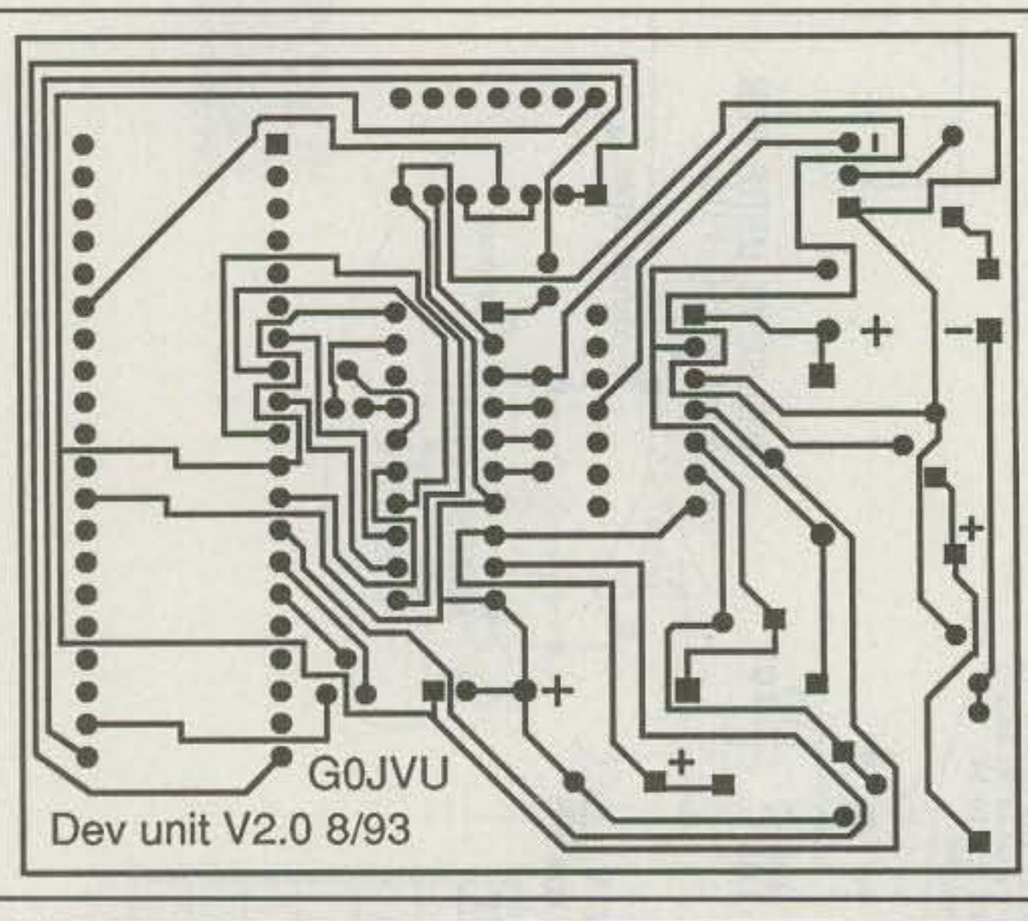
Now For The Good Stuff

With this month's "Packet User's Notebook" we are going to include the entire text from the DEVMETER.TXT file. Before we go to the DEVMETER.TXT, it is only fit ting that I mention again the names of the contributors of this new software. In addition, I wish to correct a name that I mispelled in an earlier column. My apologies to Tadd Torborg, KA2DEW. Without the contributions of these people we might not have any networks at all.

The first person I wish to thank is Dave Roberts, G8KBB. Dave is the author of the X1 code, and is responsible for changes and additions to TheNet. He is employed as an engineer with British Telecommunication, and has been a licensed amateur since 1976. Dave's mailing address is Dave Roberts, G8KBB, 7, Rowanhayes Close, Ipswich, IP2 9SX England.

The next person to whom I wish to give credit is Neville Pattinson, GØJVU. Neville supports some of the hardware projects associated with the X1 node. The printed circuit board artwork in this month's column is by Neville. Neville's mailing address is Neville Pattinson, GØJVU, 10, High Hall Close, Trimley St Martin, Felixstowe, Suffolk IP10 0TJ England.

In addition, I wish to thank the members of Suffolk Data Group (SDG/England); Tadd Torborg, KA2DEW, and the North East Digital Association (NEDA) members; and the Nord><Link group. The foundation of the new X1 code is built on the early TheNet 1.0 platform.



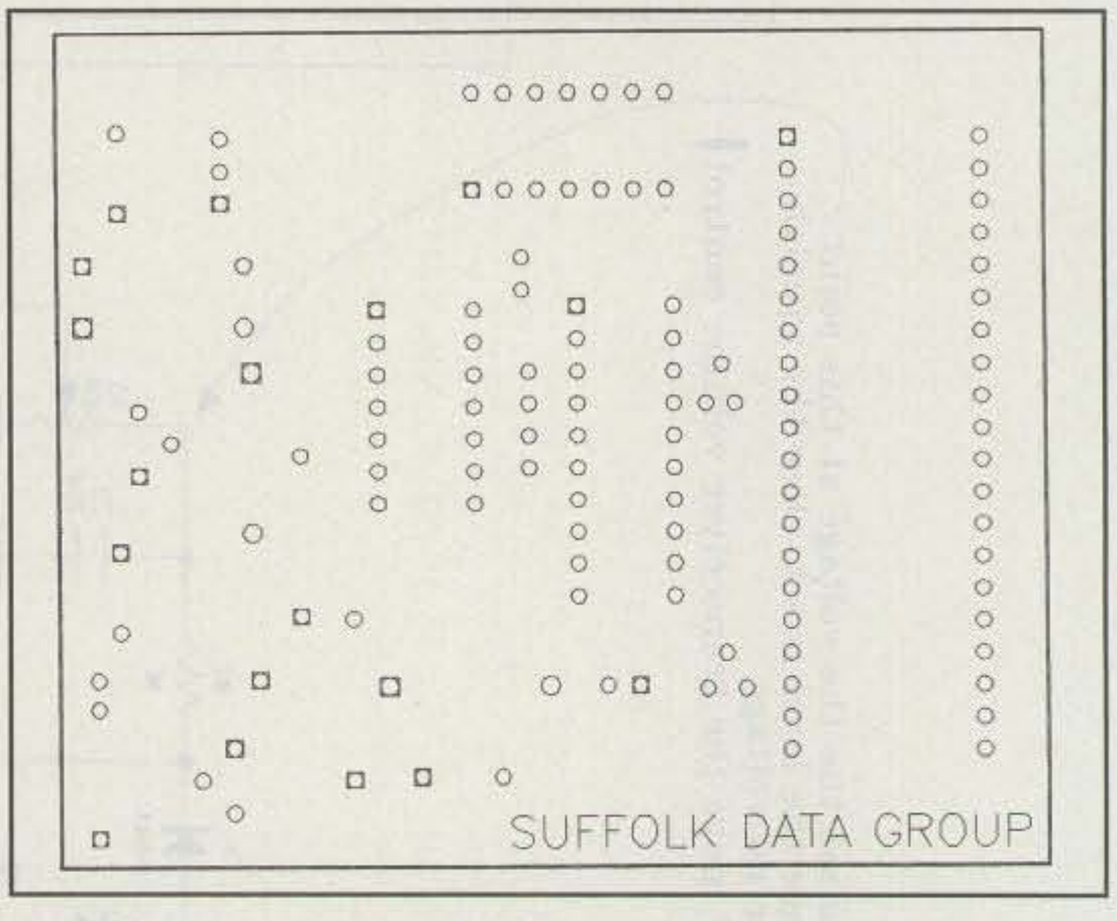


Fig. 3– (Upper lleft) Trace (foil) side of the DEV PCB near scale. User should verify component pin spacing and size.

Fig. 4– (Upper right) Note that this is not a drill template. Use only to identify the hole layout.

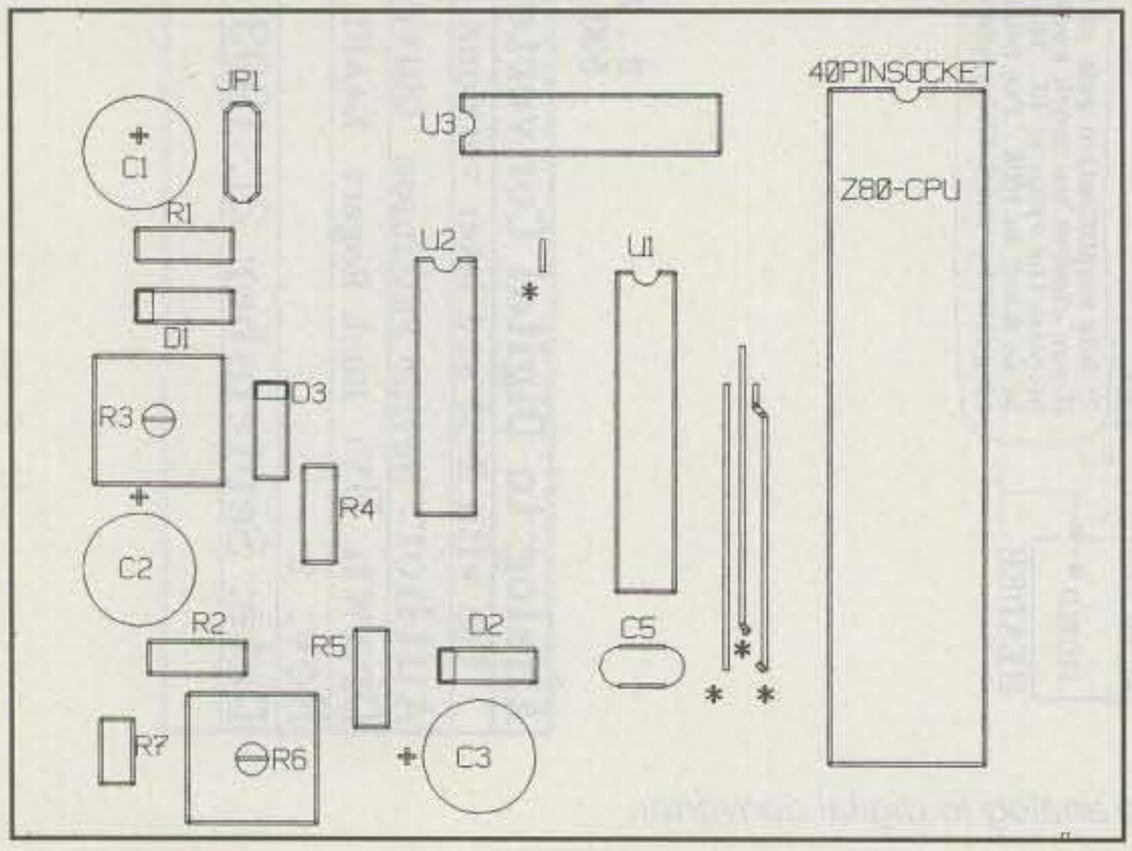


Fig. 5– (Lower left) Component side of the PCB indicating the location of all components. Note: Asterisks (*) indicate jumpers that areadded on the component side of the PCB.

A Deviation Meter For TheNet X-1J Node

The deviation meter is actually a peak audio level meter. It is the first of a series of applications built into TheNet X-series firmware that makes use of an analog to digital converter (ADC). The ADC can be (optionally) added quite simply to a TNC-2. Here we describe the circuit, its configuration and its operation.

Circuit Overview. The basic structure of the circuit is shown in fig. 2. The audio input is amplified and converted to a DC peak representation. This voltage is read by the ADC, which has a range of 0 to 3 volts, and is converted o an 8-bit binary value in the range 0 to 255.

The software is configured to read the ADC at the end of each valid packet. A packet is considered valid if its CRC is correct. As soon as a valid CRC is detected, the ADC is instructed to start converting on the deviation meter channel, this conversion taking 30 microseconds. Just before the formatted frame is linked to the chain of pending received frames, the ADC is read and the value stored with the frame.

The reading therefore corresponds to the peak audio level at the end of a packet. If there are no non-linear elements between the receiver's discriminator and the meter input, this will correspond fairly accurately to the peak deviation.

Care must be taken in its interpretation, however. It does not measure independently the two tone levels; it is assumed that the local standards that relate to pre-emphasis (i.e., use it or not) have been implemented. If used for 9600 baud FSK operation, this is not a problem.

The meter will give the wrong reading under the following conditions: badly distorted audio signal, signal badly off-frequency, incorrect adherence to local pre-emphasis standards if used for AFSK, a noisy signal.

Software. As explained above, the deviation meter is activated on receipt of a valid packet. The software interrupt routine, upon detecting a valid CRC—whether the deviation meter is installed or not, whether it is enabled or not—will instantly write the "start channel conversion" command to the ADC (I/O address 0x20) as soon as the interrupt is serviced. It will therefore also be signalled when other errors such as framing or invalid CRCs are detected.

If the CRC is correct, then about 50 to 100 microseconds later the Z80 will read the ADC and will store the corresponding value with the packet. Again, this happens whether or not the function is enabled. (It is quicker to do it than it is to test whether or not to do it!)

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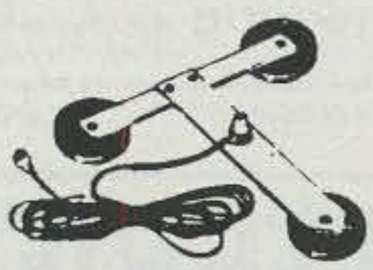

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The value received is transferred to the internal Heard list format without conversion. It is therefore still the 8-bit count (0 to 255).

When a user displays the Heard list, the deviation meter parameter (as set with the Meter command) is used to control the display. If it is zero, the deviation details are not displayed in the Heard list. If it is non-zero, then the 8-bit count value is multiplied by the Meter value to give a deviation reading in Hertz. This is displayed as kiloHertz in the Heard list. If the Meter setting is "1" it will have a full-scale range of 0.2 kHz (not very useful). If it is set to 10, it will have a full-scale range of 2.5 kHz. If it is set to 255, it will display up to 64 kHz. A typical setting will therefore be in the range 15 to 30, depending on the analog setting.

The objective is to set it such that the maximum possible audio level from the receiver, given its filters, corresponds to just under the 3 volt maximum input to the ADC.

The deviation is displayed to a resolution of 100 Hz, but it should not be assumed to be this accurate.

Small fluctuations in the reading can be expected.

Finally, to guard against an unnoticed overrange, the display in the Heard list will precede the deviation reading by a chevron (>) if the value read from the ADC is 254 or 255.

Detailed Circuit Description. All of the signals necessary for this circuit are found on the Z80 CPU chip located on the TNC motherboard, with the exception of a –5 volt power supply and the audio signal to be measured. We therefore decided to base the circuit around the Z80 CPU. We knew from experience that people are reluctant to attack the inside of their TNCs with a hot soldering iron, and settled on the socket idea as the least intrusive way of gaining access to the required signals.

The circuit was designed with the amateur radio junk box in mind, with the only "specialist part" required being the ADC itself.

The input is first amplified (by 10) by U2A, a quarter part of the LM324 quad op-amp. This circuit is also a precision half-wave rectifier, which is used to reduce the effect of D1's voltage offset. A more linear response is obtained with this configuration. The output is smoothed by C2, and then R3 provides a user adjustable control for the DC representation of the received audio level into the ADC.

The second part of the quad op-amp (U2B) provides a low-impedance voltage reference drive for the ADC. R6 should be adjusted such that the DC level on pin 8 (VREF) on the ADC is equal to 3.0 volt.

The address decode for the ADC is performed by two parts of the 74HC00 (U3). The ADC is mapped to the I/O address 0x20 and is selected by the X-1J software when required.

The other three (customizable) ADC channels will be available in later releases for things such as temperature sensors, voltage sensors, signal strength, or whatever comes to mind that will be of interest to users and SYSOPs. There are also two spare op-amps within the LM324 for use with these "customizable inputs." Any input signal should be conditioned to provide a 0 to 3 volt full-scale signal into the ADC.

Construction. PCBs, PCB patterns (figs. 3 and 4), and component locations (fig. 5) are displayed in this month's column. Additionally, a kit or completed assembly will soon be available from the Suffolk Data Group in England. The assembled PCB is available in the USA from MFJ Enterprises Inc. The PCB is single-sided and approximately 3 inches by 2 inches.

The circuit is not complex, and for the more adventurous a small circuit can be built (without the need for a 40-pin socket) and then wired to the solder side of the TNC motherboard. In fact, the original prototype built on veroboard measured 1 inch by 2 inches.

The 40-pin socket on the DEV PCB is intended to be a wire-wrap type soldered to the DEV unit PCB with long legs extending down, cropped so that the PCB can be "plugged" into the 40- pin Z80 socket on the TNC motherboard. The previously removed Z80 CPU is then re-inserted in the socket on the DEV PCB.

If your TNC's Z80 is not socketed, you may wish to consider adding one now! Otherwise you will need to work out some other way of getting the necessary signals to the DEV board.

I suggest fitting a "tin-plate" folded pin socket, as the wire-wrap sockets will locate into them. Turned pin sockets present extreme difficulty in mating with the square-section wire-wrap sockets.

If there is not enough clearance in the TNC box for the extra PCB, you could consider using a header plug, with the necessary signals being transferred to the DEV board, mounted elsewhere, via a short cable.

There are three other connections that need to be made from the DEV PCB to the TNC motherboard:

1. JP1 pin 1—cable shield for audio signal (Earth).
2. JP1 pin 2—audio input from rig (5-pin DIN inside TNC).
3. JP1 pin 3— –5V (from TNC motherboard).

Solder in the components in the usual way, taking care not to make any solder bridges to the tracks running in between

the IC pads. Ensure that the chips and polarized components are the right way around, and take the usual ESD precautions. There are four wire links needed on the PCB to complete the single-sided circuit.

Alignment. There are four adjustable controls that will need to be set up for correct operation.

1. Radio's audio drive signal into the TNC (volume control).
2. Deviation signal level control (R3).
3. Reference voltage for the ADC (R6).
4. The meter parameter within X-1J.

Best Set-Up Sequence (To Date)

1. Adjust R6 on the DEV board to give 3.0V input into pin 8 of the ADC.

2. Attach an oscilloscope (if available) to pin 1 of the LM324. Turn the rig's squelch control such that the squelch noise is driving the input of the DEV circuit. Adjust the rig's audio drive signal into the DEV circuit so that the output of the op-amp is just clipping the power rails. This will be seen as a 10V peak-to-peak signal.

3. Adjust R3 to give the maximum DC signal into pin 3 of the ADC. This should be 3V maximum.

Note: The function of R3 is to scale the input voltage into the ADC. The maximum signal available from the circuit is approximately 3V, which corresponds to the full range of the ADC. A 3V input into the ADC will enable the circuit to present the widest possible range of values to the X-1J software. Significant "unexplained" variations in the reported deviation (MHeard list), however, can be reduced by lowering the input voltage to the ADC. If you do need to adjust this voltage, then you will also have to adjust the Meter parameter within the X-1J software again.

4. The Meter parameter within X-1J gives the final adjustment to the circuit, converting the received binary number into a meaningful deviation in kHz. In practice with the unit operating as described above, a value of 47 was found to provide a true representation of the displayed deviation to the measured deviation. To ensure an accurate measurement is given to the user, you will need to calibrate the function using a signal with a known deviation!

As you can see from the above set-up procedure, if you change the setting of the volume on the rig afterwards, all will be lost! It is preferable to take the audio from before the audio amplifier sections of the receiver (ideally, direct from the discriminator) and to adjust the parameters or op-amp gain accordingly.

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AWARDS

BY NORM VAN RAAY, WA3RTY

NEWS OF CERTIFICATE AND AWARD COLLECTING

We turn November's spotlight on USA-CA #769, Raymond A. Weigand, N7POK.

Ray received his amateur radio license 60 years ago, in 1933. His first rig was a homebrew transmitter with a 245 in a TNT circuit and a Zepp antenna. His current rig, a Kenwood TS-140S, is quite different from the old days, Ray tells us. Over the years Ray has made many friends in amateur radio. He is proud to point out that he has never received a pink slip from the FCC.

On June 6, 1993 Ray celebrated 51 years of marriage to Florence, and he celebrated his 79th birthday a few days later. In addition to his fond memories of marriage and the many friends he has made through "the world's greatest hobby," Ray shares the following memory.

It was not a happy June in 1942 in the middle of the Atlantic during WW II. Ray's ship was being shadowed by the German ship *Graf Spree* for several days. Ray was sure he and his shipmates would never get home. Someone was watching over them, however, and they eluded the German ship.When Ray got home from the war he checked his QSL cards, and there from before the war was a card from a DL. The German amateur was a telegrapher stationed on that same ship, the *Graf Spree*. As they say at Disneyland, "It's a small world after all."

Recently the Weigands experienced one of the hazards of California living—an earthquake. They wasted no time getting out of the house, and fortunately there was no damage to their QTH. They did question their move to California from Florida, though.

Ray expresses his appreciation to all the good County Hunters, and especially those super net controls who helped him along the way. He mentions in particular Ed Sanders, WA6VJP, and Sally, who kept him posted when one of his counties was coming up. They even called long distance if Ray wasn't on the air. Thanks also to Darrell Craig, KK6BB, for getting the last two in Colorado, and Woody Crane, NØCYB, who went out of his way to get Johnson County, Nebraska for his final county. *(KK6BB is currently on Formosa with his family—ed.)*

Congratulations to Ray, N7POK, USA-CA All Counties #769.

Awards Issued

James A. Paulick, KA9PZS; Dallas R. Burgess, WU8Q, and Paul W. Lindvall, WD9EJK all submitted complete applications to qualify for their USA-CA All Counties numbers and are eligible for a plaque from *CQ* magazine.

Others who moved into our Honor Roll category are:

USA-CA 500: Sadayuki Satoh, JH1UUT; James A. Paulick, KA9PZS; Dallas R. Burgess, Jr., WU8Q; Paul W. Lindvall, WD9EJK; Larry D. Hagen, KG7GV; John C. Kanode, N4MM; Jose Emanuel Ribeiro De Sa, CT1EEB; Sheridon "Don" Street, A92BE.

USA-CA 1000: James A. Paulick, KA9PZS; Dallas R. Burgess, Jr., WU8Q; Paul W. Lindvall, WD9EJK; Larry D. Hagen, KG7GV; John C. Kanode, N4MM; Sheridon "Don" Street, A92BE.

USA-CA 1500: James A. Paulick, KA9PZS; Dallas R. Burgess, Jr., WU8Q; Paul W. Lindvall, WD9EJK; Larry D. Hagen, KG7GV; John C. Kanode, N4MM.

USA-CA 2000: James A. Paulick, KA9PZS; Dallas R. Burgess, Jr., WU8Q; Paul W. Lindvall, WD9EJK; Larry D. Hagen, KG7GV; John C. Kanode, N4MM.

USA-CA 2500: James A. Paulick, KA9PZS; Dallas R. Burgess, Jr., WU8Q; Paul W. Lindvall, WD9EJK; Larry D. Hagen, KG7GV; John C. Kanode, N4MM.

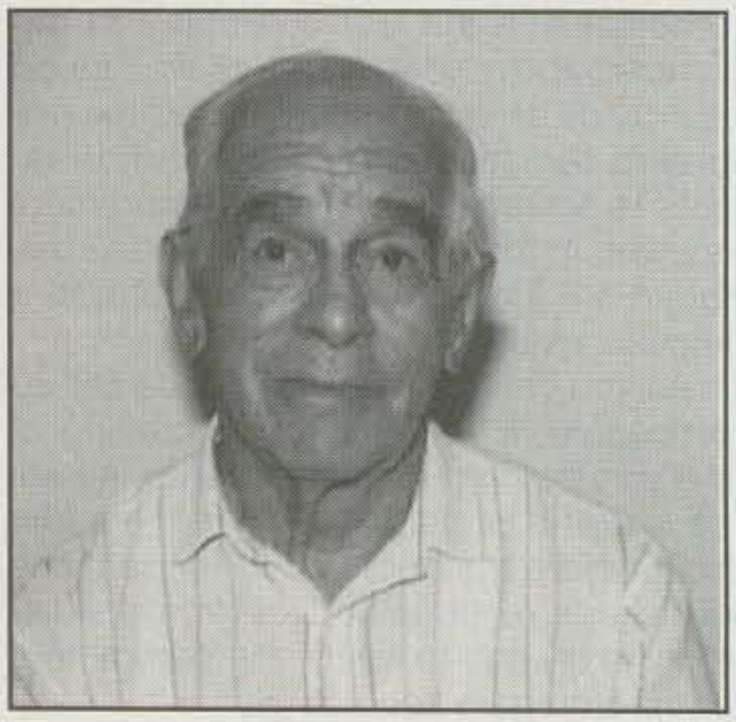
USA-CA 3000: James A. Paulick, KA9PZS; Dallas R. Burgess, Jr., WU8Q; Paul W. Lindvall, WD9EJK; John C. Kanode, N4MM.

Congratulations to all our honorees this month.

Awards

200 Years Lord Howe Island Award. The 200 Lord Howe Island Award, originally issued on the occasion of the discovery of Lord Howe Island (17 February 1988) as a short-time award, generated an unexpected high number of applications, demonstrating that many amateurs would like to receive this award. The chairman of the museum of Lord Howe Island has therefore announced that the award will continue to be issued for contacts after December 31, 1988 with the following rules.

All contacts with Lord Howe Island after January 1, 1987 will count. Stations from Oceania need 6 contacts; all other stations require 2 contacts. Three different awards are issued: two-way SSB, two-



Raymond A. Weigard, N7POK, USA-CA #769.

Honor Roll

3000	
KA9PZS	834
WU8Q	835
WD9EJK	836
N4MM	837
2500	
KA9PZS	912
WU8Q	913
WD9EJK	914
N4MM	915
2000	
KA9PZS	988
WU8Q	989
WD9EJK	990
KG7GV	991
N4MM	992
1500	
KA9PZS	1078
WU8Q	1079
WD9EJK	1080
KG7GV	1081
N4MM	1082
1000	
RA6AR	1282
KB4HBH	1283
W3FTG	1284
KV1M	1285
W3FG	1286
KA9PZS	1287
WU8Q	1288
WD9EJK	1289
KG7GV	1290
N4MM	1291
A92BE	1290
500	
JH1UUT	2701
KA9PZS	2702
WU8Q	2703
WD9EJK	2704
KG7GV	2705
N4MM	2706
CT1EEB	2707
A92BE	2708

Note that USA-CA numbers 1282–1286 are corrections to Octobers listing. The total number of counties for credit for the United States of America Counties Award is 3076. The basic award fee for subscribers to *CQ* is $4.00. For non-subscribers it is $10.00. Initial application must be submitted in the USA-CA Record Book, which may obtained from CQ Communications, 76 N. Broadway, Hicksville, NY 11801 USA for $2.00. To qualify for the special subscriber rate, please send a recent *CQ* mailing label with your application. To be eligible for the USA-CA Award applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 15, 1991. A complete copy of the rules may be obtained by sending an SASE to Norm Van Raay, WA3RTY, USA-CA Custodian, Box 76, Pleasant Mount, PA 18453-0076 USA. DX stations must include extra postage for airmail reply.

Special Honor Roll

James A. Paulick, KA9PZS
USA-CA All Counties #810
Mixed Band & Mode, 8-21-93

Dallas R. Burgess, Jr., WU8Q
USA-CA All Counties #811
SSB, All Mobile, Mixed Band, 8-25-93

Paul W. Lindvall, WD9EJK
USA-CA All Counties #812
SSB, Mixed Band, 9-8-93

Box 76, Pleasant Mount, PA 18453-0076

Say You Saw It In CQ

way CW, and two-way Mixed Mode. The award consists of a high-quality porcelain dish suitable for wall-hanging with the motif of Lord Howland Island.

Applicants (all licensed radio amateurs and SWLs) must send a GCR list (SWLs must include QSL cards or photocopies) confirmed by two licensed radio amateurs or an officer of their national radio association.

The fee of $17 or 26 IRCs includes cost of mailing, packing, insurance, and a contribution to the museum of the island.

Applications should be sent to Rudi Muller, VK9LM/DJ5CQ, Alter Main 23, D 96179 Ebing/Bamberg, Germany.

On A Personal Note

August was not a good month for the Van Raays. First Carol hit a deer and did about $2000 of damage to the car. Next I wound up in the hospital with a kidney stone (not a pleasant experience). And on Friday, September 3 a wicked summer storm came through and took down my antenna, along with the top two sections of my tower. My insurance company is not very happy. It has to get better.

I am, however, looking forward to having an eyeball with all the county hunters attending the Murfreesboro, Tennessee Convention, November 4–6. I'll be bringing some *CQ* goodies as door prizes. Hope to see you there!

73, Norm, WA3RTY

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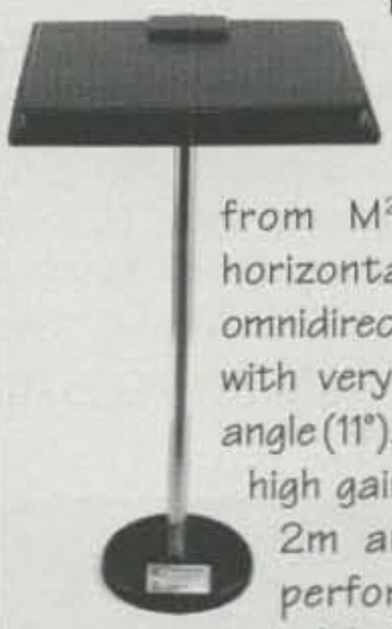

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DX

BY CHOD HARRIS, VP2ML

NEWS OF COMMUNICATION AROUND THE WORLD

Eritrea: A Once and Future Country

On August 30, 1993 the ARRL DX Advisory Committee (DXAC) voted unanimously to restore Eritrea to the DXCC Countries List. Eritrea was a separate country on the DXCC list until November 14, 1962. The DXAC action (if confirmed by the ARRL Awards Committee) will remove this country from the Deleted Countries list and return it to the current list. The DXAC voted unanimously *not* to make Eritrea a *new* DXCC country.

While the DXAC vote to restore Eritrea to the current countries list was unanimous, their vote was split on the effective date of this restoration. Nine members of the 16-member panel voted for an effective date of May 24, 1993, while six voted for May 24, 1991. (April 27, 1993 received the other vote.) To understand why Eritrea was once, and now is again, a separate DXCC country, and why the DXAC vote was so divided on the effective date, we need to review some of the complicated history of the region.

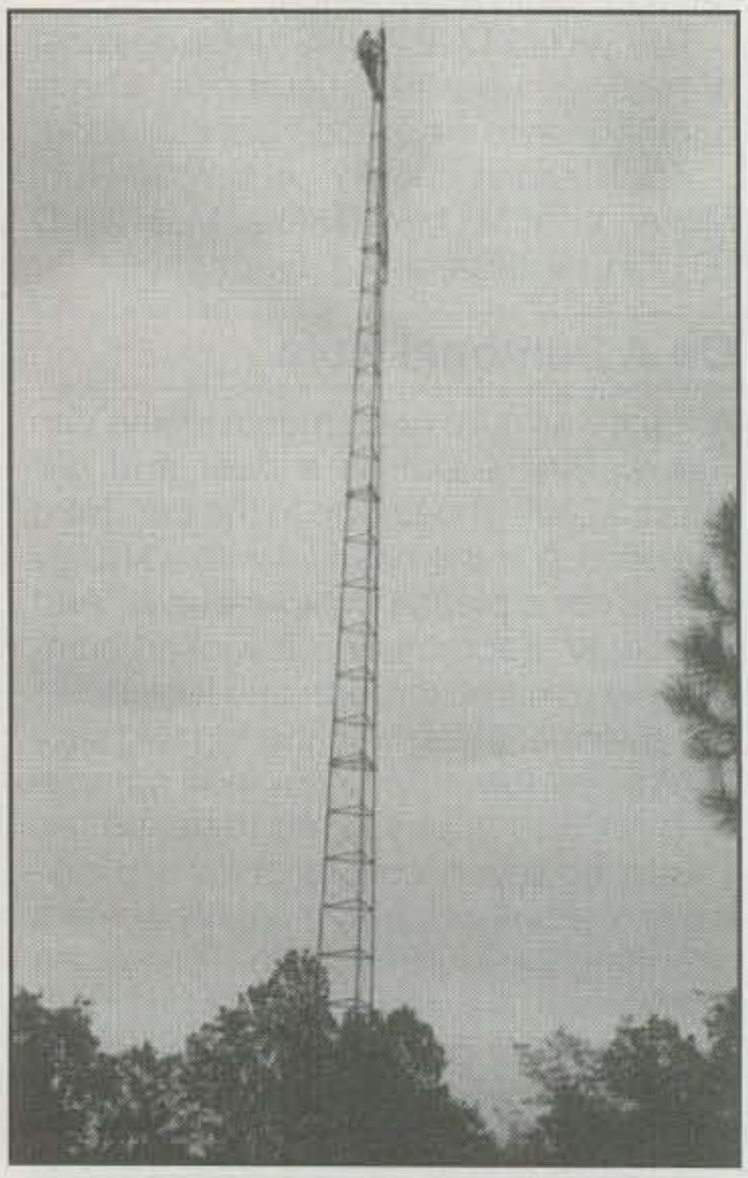
In the late 19th century Italy established Eritrea on the southern bank of the Red Sea as its first colony. In typical colonial fashion, Italy dominated the country, taking the best land for Italians, and prohibiting contact between the colony and Europe. In 1935 the Italians moved inland from Eritrea, conquering the kingdom of Ethiopia the following year.

In 1941 the British liberated Ethiopia and brought an end to Italy's East Africa colonies. The British continued to occupy the region following the end of World War II. In December 1950 the United Nations passed Resolution 390A, which established a federation of two countries—Ethiopia and Eritrea—over the objections of the Eritreans, who wanted a completely separate country. However, the emperor of Ethiopia, Haile Selassie, lobbied for and retained a measure of control over Eritrea.

Under the terms of the UN resolution Eritrea remained as an "autonomous unit" of the federation, with Ethiopia handling many of the affairs of the country, including foreign affairs, finance, defense, customs, and communications. Even this level of control was not enough for Selassie, however, and he unilaterally annexed Eritrea on November 14, 1962. Since this dissolved the federation and made Eritrea a province of Ethiopia, the separate DXCC country of Eritrea was deleted from the current country list as of that date.

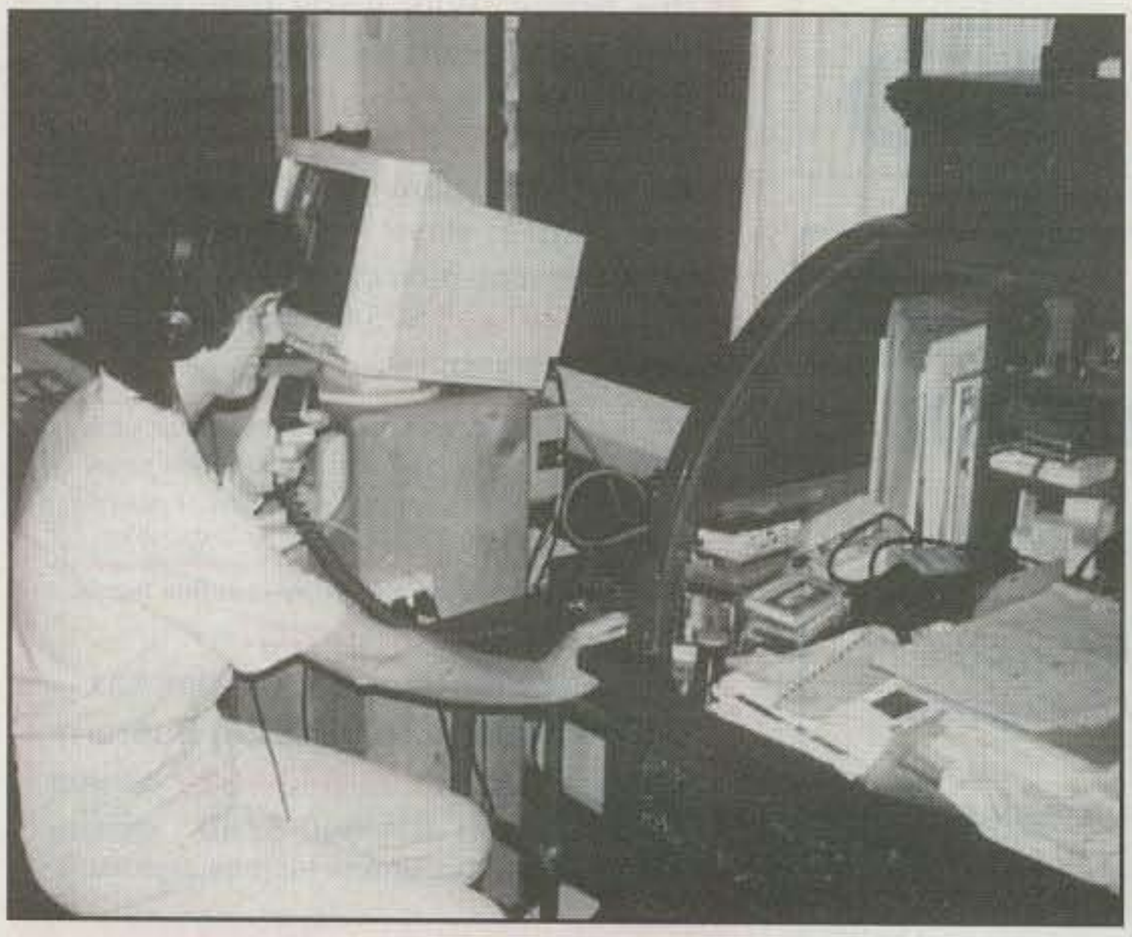
Even before Selassie annexed Eritrea, however, an Eritrean separatist movement was active. The Eritrean Liberation Front (ELF) traces its history back to 1961. The ELF attracted considerable support among Arab countries, especially Libya and Syria. Meanwhile, Selassie appealed to the US for assistance in putting down the "rebellious" Eritreans. Over the next 30 years the ELF, and a subsequent Eritrean independence movement called the Eritrean People's Liberation Front (EPLF), pushed the fight against the Ethiopian government of Selassie. The EPLF attracted a wider base of support than the mostly Moslem ELF, including many of the Christian Eritreans. The differences between these two movements eventually led to a 2½ year civil war in the early 1970s.

Once this war ended in 1974, the Eritreans turned their attentions and arma-



Collin Guy, ON4ACG, has a 125 foot high vertical for 160 meters in nearby France.

P.O. Box 50, Fulton, CA 95439



← *Linda Gibson, HSØZAL ,and her husband John, HSØZAK, operate from this Bangkla, Thailand location. Try 20 meters at 1300–1500Z.*

John Janssen, C91J, in Maputo, Mozambique. (Thanks to Paul Geerdes, K8JJC)↓

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The WPX Program

SSB

2396	7J1AAL	2399	WQØH
2397	HK6DOS	2400	KG5VI
2398	KD1CT	2401	VE1QX

CW

2788	VE1TX	2789	DF6SW

MIXED

1610	YV5KWS	1613	JR2TRZ
1611	DKØEE	1614	HK3DDD
1612	W5QZ		

Mixed: 450 YV5KWS, DKØEE, W5QZ, JR2TRZ, HK3DDD, AD4X. 500 YV5KWS, DKØEE, W5QZ, JA3WFQ, JR2TRZ, HK3DDD, AD4X. 550 KD1CJ, YV5KWS, DKØEE, W5QZ, JR2TRZ, KT5Y, HK3DDD. 600 YV5KWS, DKØEE, W5QZ, KT5Y, HK3DDD. 650 JA4DUD, DKØEE, W5QZ, WA3FWA, KT5Y, HK3DDD. 700 JA4DUD, DKØEE, W5QZ, WA3FWA, HK3DDD. 750 DKØEE, W5QZ, HK3DDD. 800 DKØEE, W5QZ, HK3DDD. 850 DKØEE, HK3DDD. 900 DKØEE, HK3DDD. 950 DKØEE, HK3DDD. 1000 DKØEE, HK3DDD. 1050 HK3DDD. 1100 HK3DDD, HP2CWB. 1150 HK3DDD. 1200 HK3DDD. 1250 HK3DDD. 1300 HK3DDD. 1350 HK3DDD. 1400 HK3DDD. 1700 W3KH. 1750 W3KH. 2050 N4UH. 2250 WB2YQH. 3100 SM3EVR, W2FXA. 3200 N4NO. 3250 N4NO. 3300 N4NO. 3350 N4NO.

SSB: 350 JA3WFQ, 7J1AAL, HK6DOS, KD1CT. 400 JA3WFQ, 7J1AAL, HK6DOS, KD1CT. 450 JA3WFQ, 7J1AAL, HK6DOS, KD1CT. 500 7J1AAL, HK6DOS, KD1CT. 550 HK6DOS, KD1CT. 600 HK6DOS, KD1CT. 650 JA4DUD, HK6DOS. 700 JA4DUD, HK6DOS. 750 HK6DOS. 800 HK6DOS. 850 HK6DOS. 900 HK6DOS. 950 HK6DOS. 1000 HK6DOS, HP2CWB. 2450 N4NO. 2500 N4NO. 2550 N4NO.

CW: 350 VE1TX, VE1QX. 400 VE1TX,VE1QX. 450 VE1TX, K2LUQ, VE1QX. 500 VE1TX, VE1QX. 550 VE1TX, VE1QX. 600 VE1TX, VE1QX. 650 VE1TX, VE1QX. 700 VE1TX, N5GFX, VE1QX. 750 VE1TX. 800 VE1TX. 950 LA3GI. 1000 AH6JH, 1500 KBØG. 1800 G3VQO. 1900 W8IQ. 2750 N4NO. 2800 N4NO. 2850 N4NO. 3450 WA2HZR. 3500 WA2HZR.

10 Meters:	W8IQ, VE3DUS, JA4DUD, DKØEE, IKØADY
15 Meters:	W8IQ, DKØEE, IKØADY
20 Meters:	DKØEE, 7J1AAL, IKØADY
40 Meters:	W8IQ, DKØEE, IKØADY
80 Meters:	VE3DUS, DKØEE, IKØADY
160 Meters:	DKØEE

Asia:	DKØEE, 7J1AAL, DJ7HX
Africa:	DKØEE, DL2HBX
No. Amer.:	WWØE, DKØEE, WB2PCF, VE1QX
So. Amer.:	W8IQ, DKØEE
Europe:	DKØEE, WB2PCF, VE1QX
Oceania:	DKØEE, 7J1AAL

Award of Excellence Plaque Holders: I8YRK, W4CRW, SMØAJU, K5UR, K6XP, N5TV, K2VV, VE3XN, W6OUL, DL1MD, DJ7CX, DL3RK, WB4SIJ, SM6DHU, N4KE, I2UIY, DL7AA, ON4QX, WA8YIM, YU2DX, OK3EA, I4EAT, OK1MP, N4NO, ZL3GQ, VK9NS, DEØDXM, DK4SY, UR2QD, AB9O, FM5WD, I2DMK, W4BQY, IØJX, SM6CST, VE1NG, I1JQJ, WA1JMP, PY2DBU, HI8LC, KA5W, KØJN, W4VQ, KF2O, K3UA, HA8XX, HA8UB, W8CNL, K7LJ, W1JR, F9RM, W5UR, WB8ZRL, SM3EVR, CT1FL, K2SHZ, UP1BZZ, W8RSW, WA4QMQ, EA7OH, K2POF, DJ4XA, IT9TQH, W8ILC, K2POA, N6JV, W2HG, ONL-4003, VE7DP, K9BG, W5AWT, KBØG, HB9CSA, F6BVB, W1BWS, YU7SF, G4BUE, N3ED, DF1SD, K7CU, I1POR, LU3YL/W4, NN4Q, KA3A, YBØTK, VE7WJ, VE7IG, K9QRF, YU2NA, N2AC, W4UW, NXØI, W9NUF, N4NX, SMØDJZ, DK5AD, WB4RUA, DK5AD, WD9IIC, W3ARK, I6DQE, LA7JO, VK4SS, K6JG, I1EEW, I8RFD, I3CRW, VEFXR, N4MM, KC7EM, ZS6BCR, CT1YH, IV3PVD, KA5RNH, ZP5JCY, F1HWB, KC8PG, NE4F, VE3MS, K9LJN.

Award of Excellence Plaque Holders with 160 Meter Endorsement: FM5WD, SMØDJZ, DK5AD, SM6CST, I1JQJ, PY2DBU, W3ARK, HI8LC, KA5W, UR2QD, VE3XN, K6XP, LA7JO, W4VQ, K6JG, K3UA, HA8UB, W4CRW, N4MM, K7LJ, SMØAJU, KF2O, SM3EVR, K5UR, UP1BZZ, OK1MP, N5TV, K2POF, W8CNL, DJ4XA, IT9TQH, DL9RK, N6JV, ONL-4003, W1JR, W6OUL, W5AWT, KBØG, F6BVB, W4BQY, YU7SF, W5UR, N4NO, DF1SD, K7CU, I1POR, W8RSW, N4KE, I2UIY, YBØTK, W8ILC, W1BWS, VE7WJ, K9QFR, NN4Q, W4UW, K9QFR, NXØI, G4BUE, LU3YL/W4, I4EAT, WB4RUA, VE7WJ, N4NX, DEØDXM, VE7IG, K9BG, I1EEW, AB9O, CT1YH, IV3PVD, KA5RNH, ZP5JCV.

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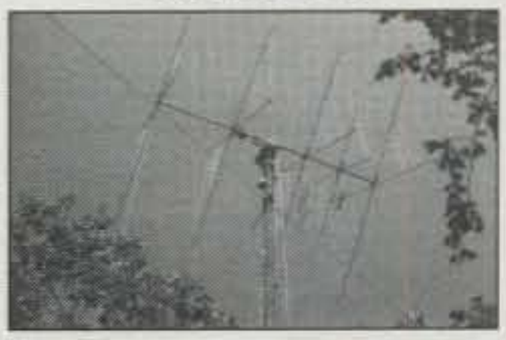

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The WAZ Program

Single Band WAZ

10 Meter SSB

464 ..... OE6CLD 465 ..... HB9ATM

15 Meter SSB

448 ..... HB9ATM

20 Meter SSB

930 ..... NR3Y 931 ..... HB9BGV

15 Meter CW

250 ..... JJ1BMB

20 Meter CW

436 ..... W8JCC

40 Meter CW

167 ..... OE3EMN

12 Meter Mixed

10 ..... K2ENT

17 Meter Mixed

22 ..... K2ENT

All Phone

618 ..... K7TED 619 ..... WA8YQR

All CW

33 ..... WQ3E 34 ..... F3SG

Satellite

5 ..... AA6PJ

All Band WAZ SSB

4099 ..... K7TED
4100 ..... HK6DOS
4101 ..... JA6IVR
4102 ..... IK7MXB
4103 ..... IK7OKB
4104 ..... WA6JCD

CW/Phone

7361 (CW) NX1Q
7362 (CW) IK2MMF
7363 ..... AD8C
7364 ..... IK7SUE
7365 ..... KØOST
7366 (CW) UA4OZ
7367 ..... WZ2H
7368 (CW) DL2AXI
7369 (CW) WA6JCD

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (75 cents) size 4¼ × 9½ to the WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Rd., Sudbury, MA 01776. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all *CQ* awards is $4.00 for subscribers and $10 for non-subscribers. Please make all checks payable to the Awards Manager. In order to qualify for the subscriber rate, please enclose your latest CQ mailing label with your application. Send any questions to K1MEM by mail and include an SASE (please do not telephone).

5 Band WAZ

As of July 31, 1993, 365 stations have attained the 200 Zone level.

New recipients of 5 Band WAZ Award with all 200 Zones confirmed:

HL1IUA

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)
K6YRA, 199 (34)
PY7ZZ, 199 (34)
KØCS, 199 (34, 40m)
AA4KT, 199 (26)
K7UR, 199 (34)
NAØY, 199 (26)
VE7DX, 199 (34)
WØPGI, 199 (26)
W2YY, 199 (26)
W9WAQ, 199 (26)
K6EID, 199 (34)
IK8CNT, 199 (12)
W1JR, 199 (23)
W8SEY, 199 (26)
N7RT, 199 (34)
VE7AHA, 199 (34)
W1FZ, 199 (26)
IK2GNW, 199 (1)
W9CH, 199 (26)
ACØM, 199 (34)
G3MXJ, 199 (12)
IK8BQE, 199 (31)
SM6AHS, 198 (12, 31)
K1ST, 198 (19, 26)
4X6DK, 198 (4, 6)
ABØP, 198 (23, 34)
UA3AGW, 198 (1, 12)
KL7Y, 198 (34, 36)
VO1FB, 198 (19, 27)
W6TC, 198 (34, 37)
EA5BCX, 198 (27, 39)
KZ4V, 198 (22, 26)

The following have qualified for the basic 5 Band WAZ Award:

DKØEE, 185 Zones
EA3EJI, 152 Zones
DL4MCF, 171 Zones
IK8DDY, 153 Zones
HB9ATM, 189 Zones

Endorsements:

KB4HU, 193 Zones

846 Stations have attained the 150 Zone level as of July 31, 1993.

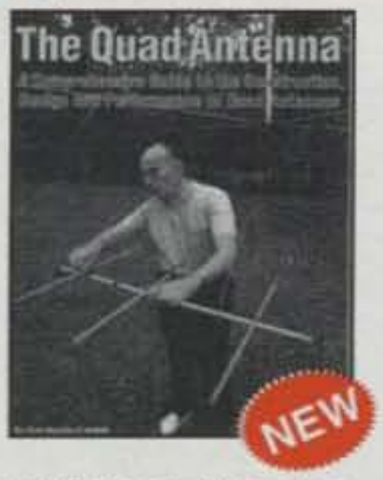
Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Road, Sudbury, MA 01776. The processing fee for all *CQ* awards is $4.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $10.00 for nonsubscribers. Please make all checks payable to the Award Manager. Applicants sending QSL cards to a CQ checkpoint or the Award Manager must include return postage. Questions regarding the WAZ Award may be sent to K1MEM with an SASE.

ment back toward Ethiopia. In the confused state of affairs which followed a successful coup against Selassie in 1974, the Eritreans scored numerous military victories. The U.S. abandoned the now-communist Ethiopian government, and the Soviet Union became the major backer of Ethiopia. By 1977 Eritrea was on the verge of winning the military battle for independence. However, Soviet supplies and advisors, and Cuban troops and pilots, turned the tide and drove the Eritreans out of the cities and up into underground strongholds in the mountains. Eritrea's former allies of South Yemen, Libya, and Syria cut off aid, leaving the "rebels" to their own resources.

Over the next 15 years the Eritreans built an entire community underground, out of sight of the occupying troops in the cities. They sent their youth overseas to train, gain needed skills and hard currency, and then return to Eritrea to continue the fight for independence. In the late 1980s the EPLF claimed a series of victories over the Ethiopian forces. Other rebel groups within Ethiopia, plus some aggression from neighboring Somalia, forced the remaining Ethiopian troops to fall back to the capital of Addis Ababa. In early 1991 the EPLF and allies surrounded Addis Ababa and forced the effective surrender of the entire country. Provisional governments took control of both Ethiopia and Eritrea until referenda could be held to determine the future of the two countries. Eritreans celebrate May 24th as their Victory Day.

CQ Books and Videos

The Quad Antenna



Hams love antenna books and this book is no exception. Written by world renowned author Bob Haviland, W4MB, The Quad Antenna is the authoritative technical book on the design, construction, characteristics and applications of Quad Antennas. Discover how to easily build a quad antenna for your station that will help you fill your logbook with rare DX that you have only dreamed about before. **Order No. QUAD..... $15.95**

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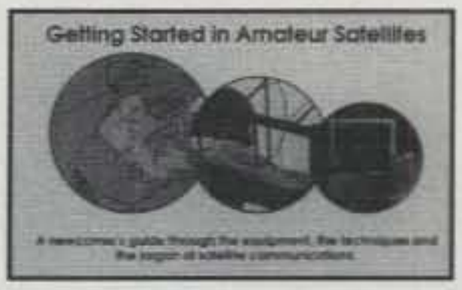

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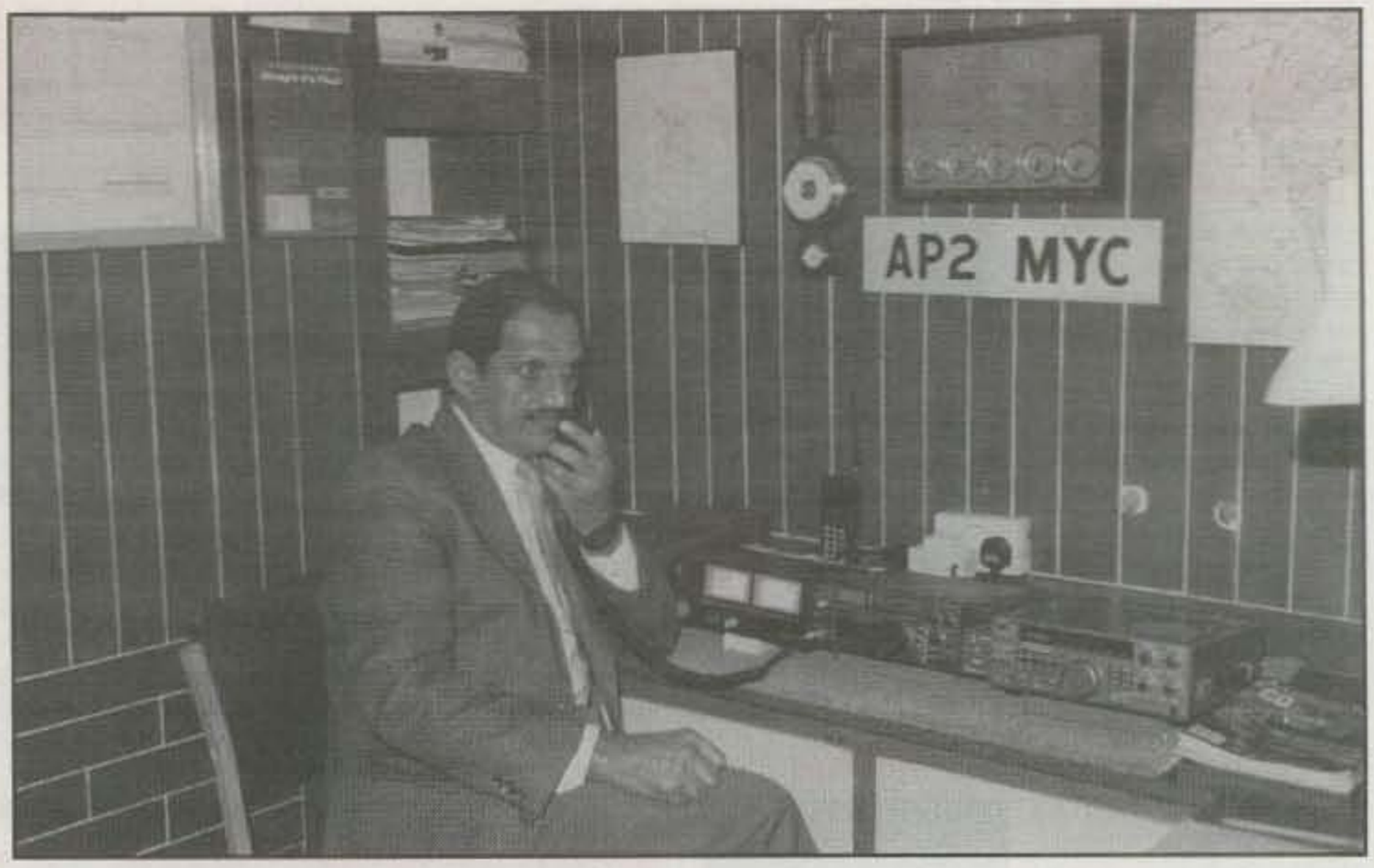

M. Yunus Chaudhry, AP2MYC, operates from Islasabad, Pakistan. Note his reading material at right.

Now things get a bit confusing. The Eritreans clearly won an important measure of independence in May 1991. However, they specifically did *not* seek international recognition of this independent status until all Eritreans had an opportunity to consider the implications of an independent Eritrea and to vote on the question. To provide ample time for this, the provisional government set April 1993 as the date of the vote.

In late April 1993 the Eritreans did indeed vote for independence by an overwhelming margin; more than 1,000,000 Eritreans in 38 countries voted in favor, while fewer than 2000 dissented. (The April 27, 1993 announcement of the vote was the source of the above-mentioned 16th vote.) To coincide with their already established Victory date, the provisional government selected May 24, 1993 as their official date of independence.

In the intervening months Eritrea applied for a callsign block from the International Telecommunications Union (ITU) and received E3. The Eritreans continued the long effort of rebuilding their country after 30 years of war and establishing, essentially for the first time ever, a truly independent country. As far as amateur radio is concerned, this two-year transition created some confusion. In October 1992 Carl Henson, WB4ZNH, and his wife Martha, WN4FVU, operated from Eritrea under the calls of 9ER1TB and 9ER1TA, under authority granted by the Telecommunications Authority of Eritrea, part of the Provisional Government of Eritrea. Carl subsequently filed a petition with the DXAC to remove Eritrea from the deleted list and add it to the current DXCC countries list. He lists several aspects of "sovereignty" that Eritrea was exercising at the time, prior to their "official" proclamation of independence in May 1993. He notes that he had to pay departure tax to the Civil Aviation Authority of Eritrea, and that a departure from Ethiopia to Eritrea was considered an international departure by the Ethiopians. Obviously, Eritrea was acting as an independent country in many ways well before May 1993.

To further complicate matters, Rudi Klos, DK7PE, visited Ethiopia and Eritrea in December 1992. Rudi operated as 9F2CW from Ethiopia and 9F2CW/A from Eritrea. Rudi says the manager of the Eritrea Telecommunications Authority visited his station in Asmara, the capital of Eritrea, and condoned the use of an Ethiopian-issued callsign, 9F2CW, from Eritrea. This manager said that he could not issue an Eritrean amateur radio license at that time, because they had no prefix allocation nor ITU recognition. On the basis of this information, and a mound of other documents from sources in and outside of Eritrea, the DXAC made the decision to recommend May 24, 1993 as the reinstatement date for Eritrea.

Assuming the Awards Committee concurs, where does this leave the Eritrean operations of the past year? The Hensons' operation of 9ER1TA/B will not count for anything, as their permission came from the Eritreans, who did not, according to the DXAC decision, have the authority to issue amateur radio permission at that time. Rudi's 9F2CW/A operation will count for *Ethiopia*, as his license was granted by that country, and the Eritrean authorities had no objection to its use in Eritrea. In essence, Eritrea remained a part of Ethiopia, as far as amateur radio is concerned, until the official date of independence in May 1993.

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries for the mode indicated. The ARRL DXCC Countries List is used as the country standard. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. Deleted countries do not count and are dropped from listing as they occur. Currently there are 328 countries. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be made at any time, in any number. Updates indicating "no change" will be accepted to meet the annual requirement. All updates must be accompanied by an SASE for confirmation. The fee for endorsement involving the issuance of a sticker is $1.00.

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There were a couple of amateur operations immediately following the May '93 start of Eritrea: **E35X** by a Norwegian team, and **E31A** by a multi-national team in August. Since both of these operations occurred *after* the May 1993 reinstatement date and were licensed by the Eritreans with a callsign from the block issued by the ITU to Eritrea, these will count for Eritrea (subject to the usual DXCC accreditation scrutiny, of course).

In retrospect, it is just as well that the DXAC picked the official date of independence over the date when Eritrea won its war with Ethiopia. There are numerous examples of regions and territories who have won, by military means, effective control over a given territory and proclaimed themselves "independent." The lack of international recognition of these self-proclaimed "states" has precluded any consideration of them as possible new DXCC countries. Otherwise, rash amateurs would be flocking to war-torn regions around the world in a effort to put "New Ones" on the air, with subsequent international confusion and possible harm. By sticking to precedent (as in the case of the new countries from ex-Yugoslavia) and requiring an official, internationally recognized state of independence, the DXAC has helped stabilize the DXCC Countries list, and has shed some light on a murky area of DX. Future DXpeditioners will have a compelling reason to wait for official independence and not to jump the gun for a possible "New One."

November (And Late October) DX Events

CQ WW SSB Operations: Michael Bill, AA7NO, Warren Hill, KF7AY, and Tony Rogozinski, N7BG, of the Central Arizona DX Association will operate **C56V** from

Banjul, The Gambia, in the CQ WW SSB Contest Oct. 30–31. Outside the test, Oct. 28 to Nov. 3, they will sign **C56/** on 80–10 meters, including the new bands, on CW and SSB. QSL C56V via Gary McClellan, KD7E, 3422 East Altadena Ave., Phoenix, AZ 85028, and individual calls via operators' home addresses. Dick, K4UTE, and other members of the North Florida DX Club will operate **VP5L** from Provodenciales islands in the Turks and Caicos in a multi-multi entry in the contest. QSL VP5L via K4UTE, and the operators' individual callsigns /VP5 via their home calls.

NL7TB and NL7VJ will operate from Beaver Creek in the Yukon Territory Nov. 19–22 on 80, 40, 20, and 15 meters. They'll be signing **/VY1**, except during the ARRL SSB Sweepstakes, when they will sign **VY1QST**. This operation will take place from NL7TB's motorhome, complete with 750 watt output into a tower-mounted tribander. (The license plate of the motorhome is VY1QRM!) Special full-color QSL cards will be available from NL7TB via the Alaska bureau, or direct to John Reisenauer, 3605 Arctic Boulevard #1830, Anchorage, AK 99503.

Duncan Kreamer, W1GAY, will be active from Anguilla **/VP2E** Nov. 11–16 SSB only on 160–10 meters. QSL his home call, via the W1 bureau or direct to P.O. Box 637, Vineyard Haven, MA 02568.

Steven Muster, G4UOL, returns to the Isle of Man again this year, trying to finish off nine-band DXCC operating only two weeks a year. He'll be active as **GD4UOL** on CW only Nov. 19 to Dec. 5. Try 10 kHz up from the bottom of the bands on the traditional bands, and 2 kHz up on the new bands (30, 17, and 12 meters). He'll also enter the CQ WW CW Contest in the low-power, single-op, all-band category. QSL via the RSGB (UK) bureau, or direct to Steve at 60 Genesta Road, Westcliff on Sea, Essex SS0 8DB, United Kingdom, with SAE and US$1 or one IRC.

And Scott Richardson, N7TNL, returns to Midway Island **/KH4** Oct. 21 to January 6, 1994. He'll be active on 160–10 meters, primarily CW, but with more SSB than during his previous trip. QSL direct to Landean Bailey, W1OO, 224 Holmes Road, RFD 2, Scarborough, ME 04074, or via the W7 bureau. Cards from Scott's previous Midway DXpedition are available via his 1993 *Callbook* address: P.O. Box 1511, Kennebunkport, ME 04046.

In other DX news, the Northern California DX Foundation is working on a special memorial in remembrance of Jim Rafferty, N6RJ. The following is a quote from the NCDXF:

As most of you are aware, the amateur radio community lost a good friend and tireless supporter with the passing of Jim Rafferty, N6RJ. One of the causes Jim's family asked people to support is the Northern California DX Foundation. A number of Jim's close friends have asked the Foundation to put together some sort of memorial that would recognize Jim's love of amateur radio and the on-going support for the Foundation and its efforts on behalf of all DXers the world over. This has been done.

From now until December 1, 1993 the Foundation will accept separate contributions in memory of Jim. These contributions will be pooled with the rest of the Foundation's resources, but the individuals donating will have their callsigns put on a plaque. This plaque will be presented to Mrs. Rafferty and subsequently hung in the Anaheim, California Ham Radio Outlet, of which Jim was vice-president.

Anyone who wishes to contribute to this memorial should send their contribution c/o the Northern California DX Foundation, P.O. Box 2368, Stanford, CA 94305, or to Bruce Butler, W6OSP, NCDXF Treasurer, 4220 Chardonnay Court, Napa, CA 94558.

QSL Information

3C1TR to K8JP
3D2RF to WA6SLO
3D2RW/R to ZL1AMO
3V8AS to IK5GQM
4J4GAT to DL1VJ
4J4GK to GW3CDP
4K3ZO to LA8PF
4K4BCU to UW6HS
4K4D to G4WFZ
4L1AA to CT1CJJ
4L8A to OZ1HPS
4L9A to IK3HHX
4M5I to I2CBM
4N5W to YU5GBC
4N7DW to YU7BJ
4O1V to YU1DX
4O4FT to YU1FW
4O9W to YU1EXY
4U1WB to KK4HD
5HØEA to EA4ARE
5NØMVE to ON7LX
5W1LJ to HB9TL
5W1MM to JE6IBJ
5X1B to KB9CR
5Z4BI to W4FRU
5Z4FO to KB4EKY
5Z4JD to F6AJA
6K93XPO to HL3EHN
7Q7BW to GØIAS
7Q7JL to GØIAS
7Q7XX to JH3RRA
7X2BK to IØWDX
7Z2AB to AAØBS
8P6AM to KU9C
8P6QA to KU9C
9A3KR to YT2KR
9A4AA to 4N2AA
9D5CW to PY2CWW
9G1MR to IK2HHX
9G1UK to G4HZR
9H3JR to DJØQJ
9H3ON to PA3BIZ
9K2DI to KA9WON
9K2GS to WB6JMS
9K2ZZ to W8CNL
9M2DM to JA7TQK
9Z5XT to WA2NHA
A35HX to DJ9HX
A71BH to OE6EEG
AA4HU/D2 to W3HDW
BA4AD to BY4AOM
BT2ØØØBJ to BY1QH
BZ4DHI to I1YKL
C49C to 5B4NC
C56X to DL7UBA
C91AI to CT1DGZ
C91J to W8GIO
CE7AOY to CE7ZK
CJ3JNC to VE3JNC
CO6RR to CM6RR
CP4BT to DL9OT
CQ9GU to CT3YW
CU9C to CU3AN
D2EYE to OZ1ACB
D2SA to F6FNU
DU7AF to AB6RW
E22DX to HS1HSJ
E31A to JH1AJT
EG1RX to EA1CNL
EJ2GSI (CW) to HB9ASZ
EJ2GSI (SSB) to HB9DEN
EJ4DW to EI4DW
ER3OWQ to SP7LZD
ET3JR to FD1OYK
EV5DX to DL5BAC
EV5M to DL5BAC
EV5WZ to DL5BAC
EV8A to F6AML
EV9A to F6AML
EXØA to DF8WS
FG4FR to F6FNU
FOØAR to JA8FCG
FOØSUG to JA1IFP
FP/VE7YL to N4DDK
GBØIB to GMØGMN
GB2PC to G3MRC
GB2TI to GM3ITN
GM3MCN to G3MCN
HC8KU to DK5VP
HG93HQ to HA5NK
HH2LQ to KM6ON
HL9KU to N7NMR
HV3SJ to IØDUD
HV3VV to IØWDX
HV4NAC to IKØFVC
IS/IØER to IØER
J28BM to K1SE
J3/CT3FN to HB9CRV
J5UAI to NW8F
J73AI to GØRNF
J88AQ to W2MIG
JX3PF to LA3PF
LY93BDX to LY2BIM
LZ7A to LZ1KBB
OHØMM to OH2MM
OM3EY to OK3MY
OM5SNP to OK3LA
OO7GO to ON5GK
OX/N7PQO to N7VVJ
OX3EW to KB5LRO
OX3MZ to OZ1KHZ
P29DX to G3LQP
P29JA to JH7MSB
P4ØWW to KD6WW
PYØTM to PY1RO
R93DS to UZ9YOR
RH8BKA to WA2NHA
RN8A to Y23VF
RO4OA to SP9HWN
S51HB to YU3HB
SU1CS to 9K2CS
T26RF to WA6SLO
T3ØJH to VK2CJH
T91DNO to DL1DAZ
T92A to S57MX
T92X to KA9WON
T93M to DL8OBC
T94IW to DL8OBC
T94ON to DL8OBC
T94US to 9A2NR
T97M to DL8OBC
T99A to I4QGU
TJ1CR to F6AXD
TM3P to F6CXJ
TM4P to FF6IPA
TM5SGE to FF1SM
TM6ACO to FF6KFI
TM93JM to FF6KNN
TR8LC to FD1PYJ
TT8OBO to WA4OBO
TU2ZR to SM3DMP
UD6DKW to DL6KVA
UHØE/RA3QJ to LZ2ZF
UIØA to G3LGK
UM7MD to FD1OJO
UN7FW to KD7H
UN8PYL to OH3MHT
UO5ODA to FD1JOE
USØRR to DL5YYM
USØU to K8YSE
UTØP to UT5UT
UW1ZZ/A to RA1ZA
UY9TI to RB5HT
V29PE to G3DLH
V44KJ to WB2TSL
V47NQ to WA4JTK
V63CS to G4WFZ
V73C to AH9C
V85AA to VK4CRR
V85BJ to VK2KFS
VI6BAT to VK6ANC
VK9CE to VK4CRR
VP2EFF to JH4IFF
VP2VE to WA2NHA
VP5M to WT1S
VP9MZ to WB2YQH
VQ9KC to AA7AN
VR2UW to VS6UW
VS6WV to KØTLM
VX3A to VE3FOI
XO7FNP to VE7FNP
XU3DWC to PAØRYS
XU5WW to LZ3WW
XX9AS to KU9C
YBØARF to N2MM
YE3C to YB3OSE
YJ8RN to N9DRU
YP7CB to YO7CEG
YT9C to YU1PJ
YW5LT to W1AF
YZ9Z to DL8OBC
Z3ØB to YU5CEF
Z3ØM to YU5GBC
Z31PK to YU5XVD
Z31RB to YU5XTC
Z31VV to YU5XCS
Z32ET to YU5DRS
Z32FK to YU5DRS
Z32KO to YU5FSO
Z32KV to YU5FCA
Z32MM to YU5GBC
Z32VV to YU3XCH
Z33BFC to YU5GBC
Z33DWY to YU5GBC
Z33KAW to YU5GBC
Z34XOP to YU5GBC
Z37GBC to YU5GBC
ZA1J to I2MQP
ZA1N to HB9BGN
ZA1Z to HB9BGN
ZD8DEZ to GØDEZ
ZD8Z to VE3HO
ZF2AH to N6RLE
ZF2JT to N6RLE
ZK1AJJ to JA2TBS
ZK1AJJ/ZK1 to JR2KDN
ZK1GEM to AAØFT
ZK2HX to DJ9HX
ZSØPI to DJ4LK
ZW7AB to PS7AB
ZXØA to PY5BVL
ZZ7SR to PP7HS
YI1MH to Magid, P.O. Box 5864, Baghdad, Iraq
Z31RT to P.O. Box 44, Kocani, Macedonia
Z32GB to P.O. Box 38, Stip 92000, Macedonia
Z32ZM to P.O. Box 179, Kumanovo, Macedonia

News From Romeo, 3W3RR

(The following was received by Ed, NT2X, who did the Russian/English translation.)

Originally, plans called for the use of six amateur radio operators for 5A. Due to the lack of funding we had to limit ourselves to three operators: Said, who currently holds the callsign 5AØRR, Danny, LZ2UU, and myself. During the operation, which lasted five days, we worked over 11,000 stations.

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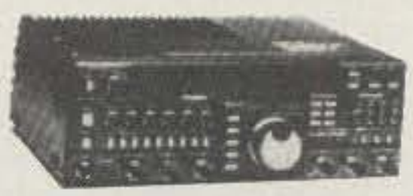

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FTH-2008/7008	IC2/4GAT/24AT
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MARINE ICOM: M7, M56, M700
AVIATION ICOM: A21 A200 H.T., TAD

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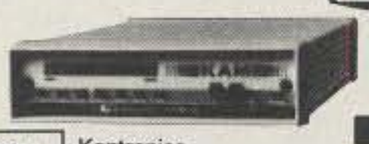

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2036	N5WNG		

CW

883	IK2MMF	885	HB9DDZ
884	KØHQW		

SSB Endorsements

320	W2FXA/328	320	SM6CST323
320	K2ENT/328	320	N4KEL/M/323
320	WA4JTI/328	320	K2ARO/323
320	WD8MGQ/328	320	IK1GPG/322
320	OZ5EV/328	320	K4SBH/320
320	XE1L/328	320	N5FG/320
320	IT9ZGY/327	320	W7ULC/320
320	KB4HU/327	320	WB4PUD/320
320	AA4KT/327	310	K4JLD/317
320	YV1KZ/327	310	K4LR/313
320	YV1AJ/327	310	F1OZF/312
320	WØSFU/327	300	4X4JO/306
320	W6BCQ/326	300	KB7IVU/302
320	PAØXPQ/326	300	WP4AFA/301
320	YU1HA/326	275	WB4UHN/294
320	WB4UBD/326	275	IK8BMW/286
320	VE2WY/326	275	VE4MT/282
320	PY4OY/326	275	4X6DK/279
320	W2CC/326	275	YB1RED/277
320	W7FP/324	200	N5WNG/200

CW Endorsements

320	W2FXA/328	310	N4AH/314
320	YU1HA/328	300	KA7T/306
320	SM6CST/328	300	K4JLD/305
320	K2ENT/328	275	KØHQW/286
320	AA4KT/328	275	WB4UBD/284
320	N4JF/328	275	HB9DDZ/284
320	WA4JTI/324	275	N5FG/275
320	PAØXPQ/323	200	IK2MMF/214
320	IT9ZGY/322	28 MHz	IK2MMF
310	DJ2PJ/319		

RTTY Endorsements

275	WB4UBD/275
250	NI4H/252
200	W4IF/215

Total number of active countries is 328. The basic award fee for subscribers to *CQ* is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an SASE is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business-size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for airmail reply. Please make all checks payable to the awards manager.

This DXpedition coincided with the International Arab Summit being held in Cairo. With mounting pressure from the worldwide ham community, we were focused on commencement of the operation and gave very little consideration to the Arab Summit. National security throughout the region was at a fever pitch.

The DXpedition was terminated when Danny and I were accused by Libyan counter-intelligence and Egyptian police of planning to assassinate both President Mubarak and Libyan leader Qadhafi. To make matters worse and even more bizarre, they said we were using ham radio as a cover for illegal drug trafficking by communicating with Turkish ships in the ports of Benghazi and Alexandria. Of course, these charges were absurd and insanely ridiculous. We were both arrested and placed in the Libyan prison system. We spent many weeks in prison and were held incommunicado. Our constant requests to speak with consular officials from Russia and Bulgaria were met with insults and abuse. This unpleasant experience, the details of which I will not go into at this time, has caused my health to deteriorate greatly and I am currently under doctor's care and receiving medical treatment. Fortunately, events unfolded resulting in our release, which was nothing short of miraculous. Perhaps, in time, this story will be told.

Said, 5AØRR, will continue to operate from Libya under this callsign, which is in effect for two years. We left him an FT-990, a FL-7000 amp, and a Mosley antenna. He is an outstanding CW operator, but might be limited in his SSB operating since we didn't have the opportunity to train him in this mode. Copies of the 5AØRR logs are in Bulgaria. QSLs are being sent.

If my medical condition permits, I hope to travel to the United States soon. At that time I will present the documentation for the 5A-Libyan operation to the American Radio Relay League. I also have in my possession the additional documentation requested by the ARRL for the P5 North Korean DXpedition.

The unwarranted and undeserved criticisms, along with false charges, leveled in my direction from the amateur radio community (some of which were anonymous), have disturbed me a great deal. I was disappointed to see how few hams supported me or rallied to my defense. Truly, it is this experience above all else which gives me great cause to consider discontinuing my efforts to put the very rarest countries on the air.

To those of you worldwide who throughout the years have always shown your friendship, support, and encouragement, thank you very much! I will always cherish our relationship as well as all the great moments and memories. Warmest regards.—73, Romeo.

QSL Notes

OX3MZ is not in the 1993 *Callbook*. QSL via David's Danish call: OZ1KHZ.

QSL **VR2UW** (ex-VS6UW) direct to Raymond Lee, P.O. Box 62316, Kwun Tong Post Office, Hong Kong.

Paolo Cortese, I2UIY, says he still has open logs and QSL cards for his operations since 1987: **OK8AFL, IO2UIY, IU2A, IR2ITU, IY2A, I2UIY/I90, IQ2A, N7PMC/WV4, N7PMC/WV6, N7PMC/WV7,** and **II2A**. His address is P.O. Box 14, 27043 Broni PV, Italy.

OK1ABB reports that his address is not correct in the *Callbook*; his correct address is P.O. Box 14, CZ-280 50 Kolin 1, Czech Republic.

Likewise, **N8ZAW** says his *Callbook* address is incorrect; his address is P.O. Box 32, Xenia, OH 45385.

QSL the 1993 IOTA contest operation of **VP5M** via WT1S. (Note this is for the July 18–25, 1993 operation only; QSL earlier VP5M contacts via N6ZJM.)

W2FXA is QSL manager for **CU1AC, UB3JX, UB2JZ, UB3JWW,** and **UR8J**.

QSL the special-event stations **IIØICO** and **IBØC** via GianFederico Madruzza, IKØAZG, P.O. Box 197, 06100 Perugia, Italy. (This station commemorated the 25th International Chemistry Olympiad at the University of Perugia.)

The special Brazilian contest call of **PW2A** was aired by two different operators in 1992. The fastest way to confirm these contacts is to send your card to the correct operator. For PW2A contest operations March–July (WPX SSB, ARI, WPX CW, WWSA, and IARU), QSL to Vitor Luis Aidar dos Santos, PY2NY, P.O. Box 145, 18001-970 Sorocaba SP Brazil; and Aug.–Sept. contests (WAE CW and SSB, SARTG and CQ WW RTTY tests) via Ariosto R. de Souza, PT2BW, P.O. Box 03858, 70084-970 Brasilia DF Brazil.

As we have mentioned previously, some of the so-called QSL managers for Albanian stations are not managers in the usual sense. Both **I2MQP** (for ZA1E, ZA1P, and ZA1J) and **HB9BGN** (for ZA1s B, C, D, F, H, K, M, Q, T, W, Z, and TAC) act as secure mail drops only. They remove the money for forwarding to Albania via safe bank transfer, and forward the accumulated cards a few times a year via a safe system (often hand-carried). Then the Albanian operators answer their own cards. This method is slow, but avoids the near-certain theft of money from envelopes mailed directly to Albania. Please be patient, and don't expect I2MQP nor HB9BGN to respond to inquiries; they are forwarded with your cards to Albania to be answered.

KG4DX is currently Jim Green, KDØXK, for the next two years. Jim's QSL manager is Dave Wester, KØIEA, 10205 217th St. N, Forest Lake, MN 55025. Note that Dave has KG4DX logs from June '93 only; that call was previously used by another operator and earlier contacts should be confirmed via KF4S.

QSL **TT8AKX** via Jacques Albinet, FD1SIL, Le Petit Etaloir, 72470 Fatines, France. (This address is not in the 1993 *Callbook*.)

Serge, **4J4JJ,** says that cards for himself, his son Alex, **4J4GK,** and their special-event calls **4J1700JJ** and **4J1700GK** should now go to GW3CDP, to keep mail costs reasonable.

QSL **KH2T** and **KH2T/KHØ** via W3HNK, for QSOs after May 1, 1993.

QSL **RC2CO** via John de Cicco, WZ2G, 1816 Avenue S, Brooklyn, NY 11229.

KH8AL (ex-WB7RFA) has a QSL manager for both his current operations from American Samoa and his previous DXpeditions: **6J8RF, V22A, V40ITU, V47ITU, FG5DX, FG9DX, FS5DX, V2A/WB7RFA,** and **KH8/WB7RFA**: David Myers, VK2DFL, 61 Fern St., Arcadia Vale. 2283, Australia.

QSL **T77C** direct, and not via KJ4VH. Tim operated from T77C, but confirmed all his QSOs via the bureau. Tony has Tim's logs, and can QSL any of those contacts direct, if needed.

73, Chod, VP2ML

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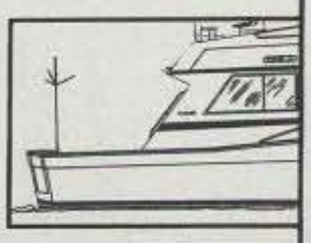

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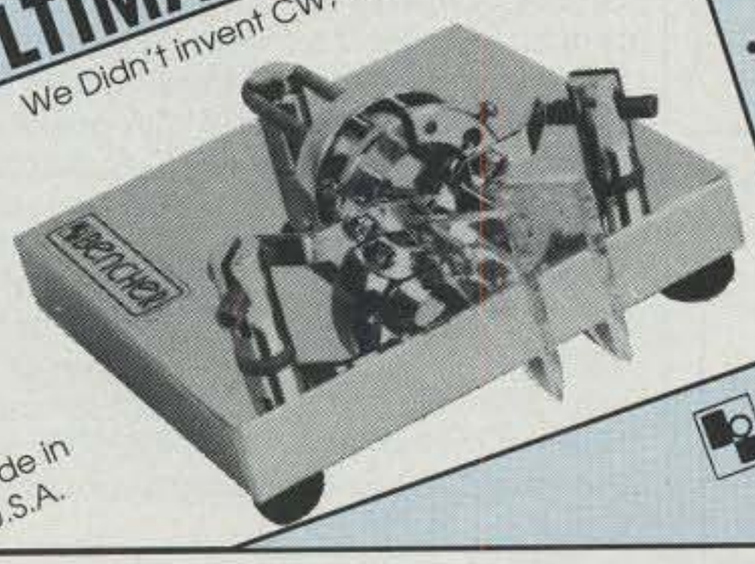

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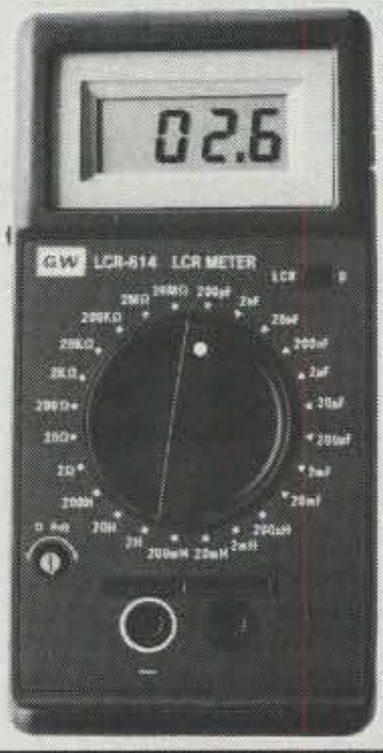

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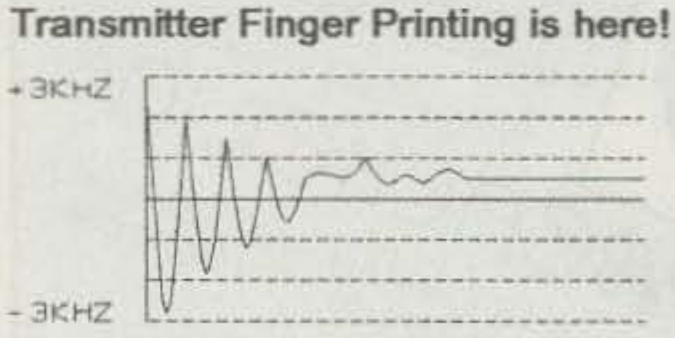

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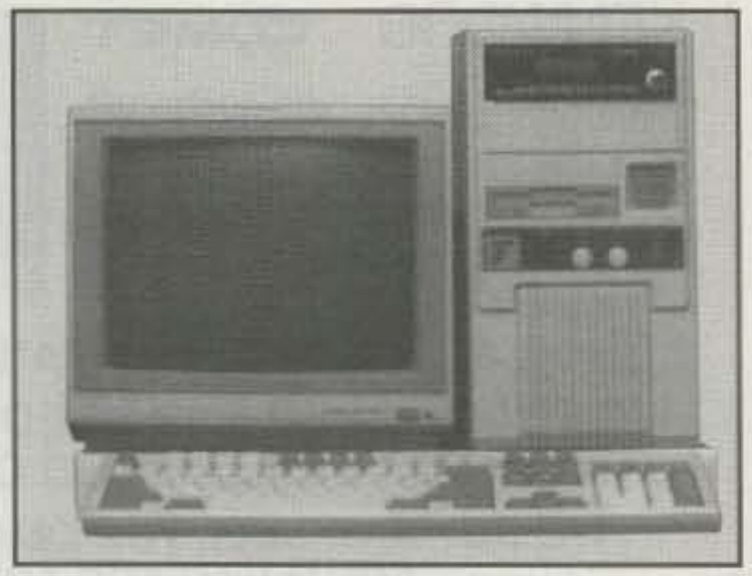


Tucker Packet Computer

Tucker Electronics and Computers has introduced their Packet Computer. The Tucker Packet Computer combines a Tucker PC compatible computer with a 2 meter radio and TNC in one cabinet. Two systems are available. Both combine a Tucker XT compatible computer with 640K, a mono monitor, 3½ inch floppy drive, serial and parallel ports, and a keyboard. Packet control for both systems is provided by the DRSI PC Packet Adapter 1, which fits inside the case and includes software. RF is provided by the Alinco DR1200T 2M Data Radio, which features 25 watts output and 14 memory channels. System 1 has the radio mounted internally and features their standard mini-tower case style. System 2 has the radio and an Astron RS-10A power supply external to the computer. Custom configurations such as upgrades to a 286-12, 40MB hard drive and 1MB RAM and other individual configurations are available. Price of system 1 is $699, and system 2 is $795. For more information, contact Tucker Electronics and Computers, 1717 Reserve Street, Garland, TX 75042-7621 (1-800-527-4642 ext. 230), or circle number 103 on the reader service card.

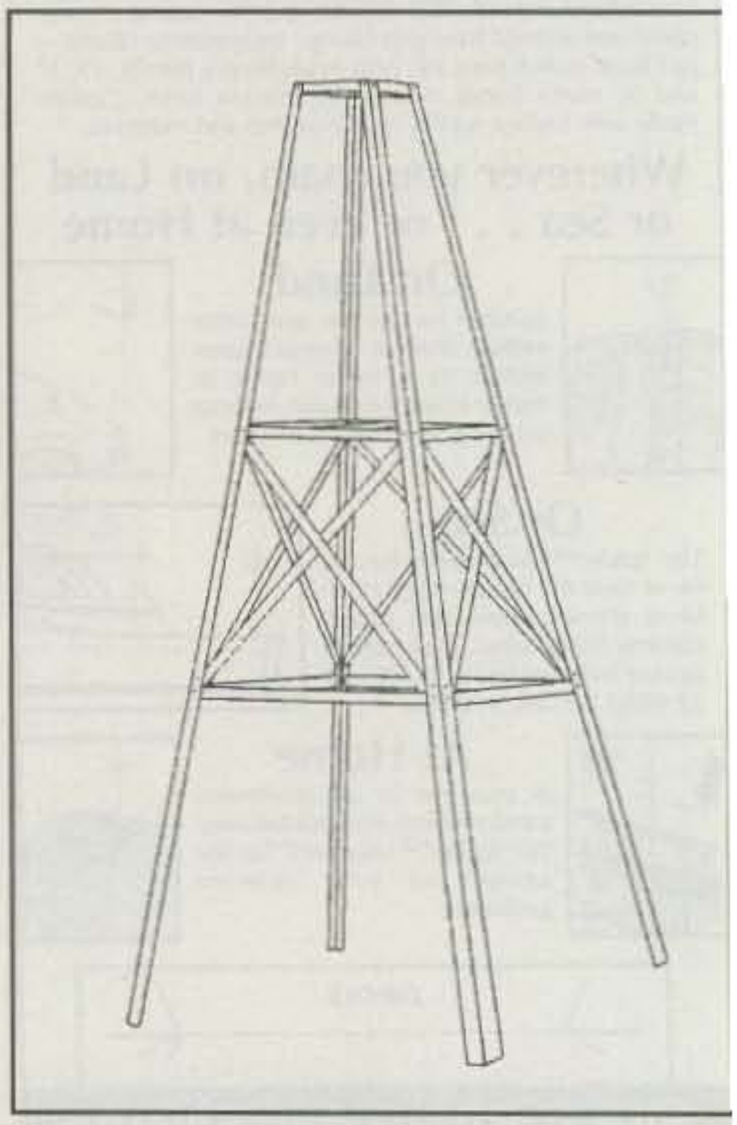
SGC Waterproof, Portable HF SSB Transceiver

SGC, Inc. has announced type certification of the model SG-715 waterproof, portable HF SSB transceiver. The unit is crystal controlled with features including 4 simplex (11 optional) channels; 2–15 MHz frequency range; and front-panel meter for signal strength and forward/reflected power indicator. Also included are tuning indicator with carrier reinsertion and tone modulator plus battery status, and a built-in half watt speaker. The SG-715 can be powered by either nickel-cadmium or gel cell batteries.

The radio is available with a variety of options. For more information, contact SGC, Inc., SGC Building, 13737 SE 26th St., Bellevue, WA 98005 (206-746-6310; FAX 206-746-6384), or circle number 104 on the reader service card.

GME Roof-Top Towers

Glen Martin Engineering has announced the availability of the RT-936 and RT-832 towers. The RT-936 is a 9 ft. tall, four-leg tower capable of mounting up to 28 square feet of wind load. It weighs 78 lbs. and is UPS shippable in two cartons, and is priced at $378.75. The RT-832 is 8 ft. tall with four legs and will support wind loads of up to 8 square feet. The RT-832 weighs 37 lbs., is UPS shippable, and is priced at $189.95.



Both towers come with rotator mounting supports and a top plate stamped for direct thrust bearing bolt-up. They are constructed of 6061-T6 angle aluminum with stainless steel hardware. For more information, contact Glen Martin Engineering, Route 3, Box 322, Boonville, MO 65233 (816-882-2734, FAX 816-882-7200), or circle number 105 on the reader service card.

Whiterook Products "ON THE AIR" Display

Whiterook Products Company's "ON THE AIR" display is RF activated. A delay circuit keeps the display on continuously until transmission is over. The unit will operate with any HF, VHF, or UHF rig, 5 watts output or greater. It has translucent red lettering with a black-background front panel (interchangeable for callsign changes) and a gray casing. The unit includes a 12 VDC adapter and a one-year warranty with ten-day money-back guarantee. The Model CSD-1 (customized display with callsign) is priced at $49.95. The standard "On The Air" display (Model CSD-2) is also $49.95.

For more information, contact Whiterook Products Company, 1555 14th Street, Santa Monica, CA 90404 (805-339-0702), or circle number 102 on the reader service card.

Svetlana Grid Tubes

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ny was founded in St. Petersburg in 1889. Today they design and manufacture power grid tubes for domestic industries. Svetlana Electron Devices, Inc., formed to bring Russian power grid tube technology to the West, is a U.S.-based company which also provides exact replacement, plug-compatible western tube types. Svetlana tubes are designed for SSB transmission, UHF and VHF television, FM broadcast, industrial heating, medical and scientific applications, and more. All tubes are backed by an extended, unconditional warranty for tubes operated under normal conditions.

For more information, contact Svetlana Electron Devices, Inc., 8200 South Memorial Pkwy., Huntsville, AL 35802-3003 (205-882-1344; FAX 205-880-8077), or circle number 108 on the reader service card.

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webbing with side release buckles for harness adjustment or removal. The MAW-100 is available for $29.95 plus $3.50 s/h. For more information, contact EMARS, P.O. Box 781204, San Antonio, TX 78278-1204 (210-493-7546), or circle number 111 on the reader service card.

Communications Specialists Catalog

Communications Specialists, Inc. has released their 25th Anniversary Catalog. The catalog is free and contains listings and brief descriptions of CTCSS and Digital CTCSS encoders and decoders, repeater products, paging encoders and decoders, and other miscellaneous tone devices. Featured in this short catalog are new products such as the ID-8 Morse Station Identifier, and PE-15 paging encoder for local addressing of POCSAG display pagers.

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WASHINGTON READOUT

REGULATORY NEWS IN THE WORLD OF AMATEUR RADIO

BY FREDERICK O. MAIA, W5YI

FCC Privatizes Commercial Radio Operator Testing

Nine Commercial Radio Operator Examination Manager's (COLEMs) met in Gettysburg, Pennsylvania, on August 26 and 27 for what may become the first of many COLEM Conferences. A COLEM is basically Commercial Radio's equivalent of the Amateur Service's VEC (Volunteer Examiner Coordinator).

FCC Private Radio Bureau Chief Ralph Haller said the objective of the meeting was to make the transition of Commercial Radio Operator examinations to the private sector as painless and as smooth as possible for everyone concerned. This transition began some seven years ago when the Federal Communications Commission asked the public whether private organizations should be authorized to prepare and administer all Commercial Radio Operator examinations.

The FCC wanted the private sector to handle commercial radio operator licenses for the same reason it wanted to turn over amateur radio operator testing to the amateur community. Government agencies have been under great pressure for years to conserve and reduce resources. And the Clinton administration is already on record favoring even more federal budget cuts. One of the answers is to offload administrative burdens that can be effectively handled by the private sector. An important side benefit is that instead of a taxpayer expense, privatization creates jobs.

In 1990 the FCC asked for and received legislation from Congress amending the Communications Act that permitted " . . . for purposes of preparing and administering any examination for a commercial radio operator license or endorsement, [the FCC] may accept and employ the services of persons that the Commission determines to be qualified."

In August 1992 a Notice of Proposed Rule Making was released seeking to implement this authority. This action was followed up six months later with a final Report and Order which told the public how privatized commercial radio operator testing would work. Part 13, which covers Commercial Radio Operators and their examination requirements, was completely rewritten by the Government.

The FCC's new program will essentially function pretty much like the Amateur Service's successful VEC System. Eventually there will be a total of seven question pools. Earlier this Spring, the FCC solicited and received over 2200 questions from the public to serve as the basis of these pools.

The first two pools of these pools have already been released: Element 1 (Radio law) and Element 3 (Electronic fundamentals and techniques). These are the requirements for the Marine Radio Operator Permit (MROP) and the General Radiotelephone Operator License (GROL). There are 170 questions in Element 1 and 729 in Element 3.

On April 7 the FCC announced a filing window for accepting requests from organizations wishing to become a Commercial Operator License Examination Manager (COLEM). Each potential COLEM had to include a description of its qualifications, conflict of interest handling, how examinations would be administered, the geographic areas where it proposes to administer examinations, what elements it proposes to provide, the frequency of the examination sessions, and its proposed fee structure.

The W5YI Group said it would form a separate division to be known as National Radio Examiners to administer all examinations in all areas at least on a quarterly basis. To prevent a conflict of interest, we said no one in our education division would have access to any specific examinations. Furthermore, any Commercial Examiner wishing to be administered a Commercial Radio examination would be required to take a random computer test generated immediately before exam. We proposed to use only accredited Amateur Extra Class and certain licensed Commercial Radio Operator licensees as examiners for all test elements.

From more than sixty groups that applied, the FCC in June chose nine COLE Managers to manage the FCC's newly privatized Commercial Radio Operator program. Among them was the W5YI Group. They all were in attendance at the COLEM Conference held in Gettysburg, Pennsylvania this past August.

COLE Managers Attend FCC Meeting

The nine COLE managers are as follows: Drake Training and Technologies, Electronic Technicians Association International (ETAI), Elkins Institute, International Society of Certified Electronics Technicians (ISCET), National Association of Business and Educational Radio (NABER), Sea School (a maritime training organization), Sylvan Kee Systems, National Association of Radio Telecommunications Engineers (NARTE), and National Radio Examiners (W5YI Group).

The W5YI Group is also involved in Amateur Service testing through its W5YI-VEC non-profit subsidiary. These nine COLEMs were chosen from more than sixty private organizations that applied to administer commercial radio operator testing. The ARRL did not apply to be a COLEM, nor has it been active in this proceeding.

Personal Radio Branch Chief Johnny Johnston pointed out to the COLEMs the need for Commercial Radio Operator licenses. In addition to being required by many corporations as a condition of employment, the International Radio Regulations and FCC Rules of many services require licensed operators to operate, maintain, and repair transmitting equipment. These include the International Fixed Service (Part 23), AM, FM, TV or Auxiliary Broadcast Stations (Part 73), and certain aircraft (Part 87) and ship and coast radio stations (Part 80).

You must hold a commercial radio operator license to repair and maintain all ship, radar, coast, aircraft, domestic, and international broadcast stations but not two-way mobile and personal radio equipment, cable TV relay, or uplink/downlink satellite stations. Aircraft, ship, and coast radio stations which operate only domestically on VHF frequencies also do not require a licensed commercial radio operator.

The FCC currently issues six types of commercial radio operator licenses (three

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radiotelephone and three radiotelegraph) and two types of endorsements. In addition, two new operator licenses, the Global Maritime Distress and Safety System Operator and Maintainer licenses, will be coming on line next year. These will replace the need for radiotelegraph operators aboard sea-going vessels.

Restricted Radiotelephone Operator Permit (RP) holders are authorized to operate most aircraft and aeronautical ground stations, and marine radiotelephone stations aboard pleasure craft. They may also operate, repair, and maintain any kind of AM, FM, TV, or international broadcast station and even act as chief engineer or chief operator of a broadcast station. There is no examination requirement for an RP, but holders must be a legal resident, be able to speak and hear English, keep some sort of log, and be familiar with the laws which govern the radio station they will operate. The RP, a lifetime license, is applied for on FCC Form 753.

MROPs (Marine Radio Operator Permits) are required to operate radiotelephone stations aboard certain vessels that sail the Great Lakes, aboard large ships and vessels that carry passengers for hire, aboard vessels that operate (sideband) on medium or high frequencies, and certain aviation and coast radiotelephone stations. To be eligible for an MROP, you must be a legal resident, able to receive and transmit in English and pass a written examination (Element 1) covering basic radio law and operating procedures. MROPs are valid for a five-year term. All applications for Commercial Radio Operator Licenses except the Restricted Permit use FCC Form 756.

A General Radiotelephone Operator License (GROL) is required to adjust, maintain, or internally repair transmitters in the aviation, maritime, and international fixed public radio services. In addition to the all of the operating authority of the MROP, it also permits operation of maritime land or ship radio stations operating with more than 1500 watts PEP and voluntarily equipped ship or aeronautical stations with more than 1000 watts of peak envelope power. You must be a legal resident to be eligible for a GROL, be able to speak in English, and pass a written examination covering basic radio law and operating procedures (Element 1) and electronics fundamentals and techniques required to repair and maintain radio transmitters and receivers (Element 3). The GROL, which replaced the old First and Second Class Radiotelephone license on June 15, 1984, is now issued for the lifetime of the holder.

Third Class Radiotelegraph Operator's Certificate authorizes operation at certain coast radiotelegraph stations. It also confers the operating authority of both the Restricted Operator Permit (RP) and the Marine Operator Permit (MROP). Besides being a legal resident and fluent in English, you must pass Morse code receiving examination at 16 code groups and 20 words per minute plain language. It is not necessary to take a telegraphy sending test, since the FCC has taken the position that if you can receive code, you also can send by hand. Written basic radio law (Element 1) and basic radiotelegraphy (Element 5) are required. All commercial radiotelegraph licenses are issued for a five-year term.

Second Class Radiotelegraph Operator's Certificate authorizes the holder to operate, repair, and maintain ship and coast radiotelegraph stations in the maritime services. It also confers all of the operating authority of the Third Class Radiotelegraph Operator's Certificate and the General Radiotelephone Operator License (GROL). You must pass Element 1 (Radio law and operating procedures for radiotelephony), Element 5 (Basic radiotelegraphy), and Element 6 (Advanced radiotelegraph). The telegraphy speed requirement is the same as for the Third Class Radiotelegraph Operator's Certificate. Amateur Extra Class operators receive examination credit for the code requirements of this license.

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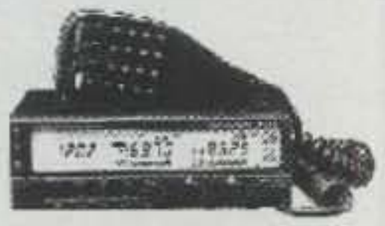

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tor's Certificate is required only for those who serve as the Chief Radio Operator on a U.S. passenger ship. It also conveys all of the operating authority of the Second Class Radiotelegraph Operator's Certificate and the General Radiotelephone Operator License (GROL).

To be eligible for this license, you must be 21 years old, have at least a year's commercial telegraphy experience, and be proficient in English. Code requirement is 20 code groups and 25 words per minute plain language. The written examination requirements are the same as for the Second Class Radiotelegraph Operator's Certificate. Proof of experience must be submitted to the FCC along with the application.

No applicant may hold more than one radiotelegraph operator license, nor may a licensed radiotelegraph operator hold a Marine Radio Operator Permit (§13.11). The previous operator license is canceled when an applicant upgrades.

Ship Radar Endorsement may be placed only on General Radiotelephone Operator Licenses (GROL) or on First or Second Class Radiotelegraph Operators' Certificates. Only persons whose commercial radio operator license bears this endorsement may repair, maintain, or internally adjust ship radar equipment. Besides holding one of the above licenses, you must additionally pass an examination (Element 8) in ship radar techniques.

Six Months Service Endorsement is required on the radiotelegraph operator's certificate of anyone who serves as the sole radio operator aboard large U.S. cargo ships sailing on the high seas. To be eligible for this endorsement, you must document that you have been employed as a radio op on a properly equipped U.S. ship at sea for six months or more. You must not only hold either a First or Second Class Radiotelegraph Operator's Certificate during this period, but a Radio Officer's License issued by the U.S. Coast Guard at the time the six month service endorsement is requested.

There are other endorsements that can be added to licenses such as broadcast disclaimers and physical handicap restrictions.

Commercial Radio Operator Testing

Johnston told the COLEMs that the goal of the new COLE System is (1) convenient exam opportunities, (2) uniform standards, and (3) respect (high integrity).

While the COLE System is patterned after the VEC testing, there are several significant differences. The Volunteer Examiner Coordinators maintain the question pools, the VEs give element credit, and both screen applications for correctness. And there is a conflict-of-interest statute that is based on "publications." Volunteer examiners cannot distribute license preparation materials and be an examiner.

The COLE System only requires Commercial Operator License Examination Managers (COLEMs) to train examiners to prepare and administer examination elements. The FCC maintains the questions and handles all other administrative functions. Examiners who also participate in amateur operator examinations are not permitted to mix Commercial and Amateur Radio Operator testing at the same time. They must be kept separate.

Both the VEC program and COLE System prepare their examinations by randomly selecting a specified number of questions from each element or subelement. And as in the Amateur Service, all possible Commercial Radio Operator license exam questions and their multiple-choice answers must be released to the public before they may be used in any examination.

The COLE System procedure is a two-step process.

1. The COLEM (or their delegated examiners) collects the fee, administers the appropriate examinations, and issues a "PPC" (Proof-of-Passing Certificate). The PPC is the commercial equivalent of the VEC System's CSCE (Certificate of Successful Completion of Examination). It allows examination credit on specific test elements for a period of 365 days.

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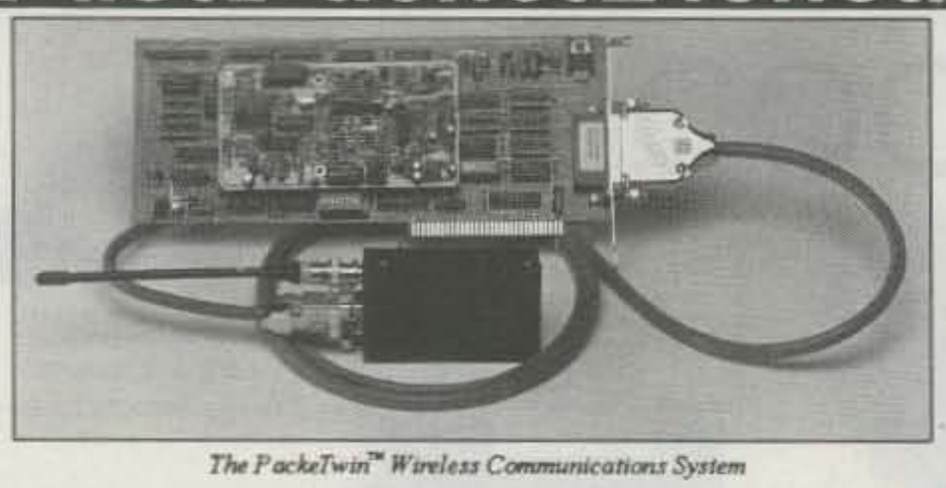

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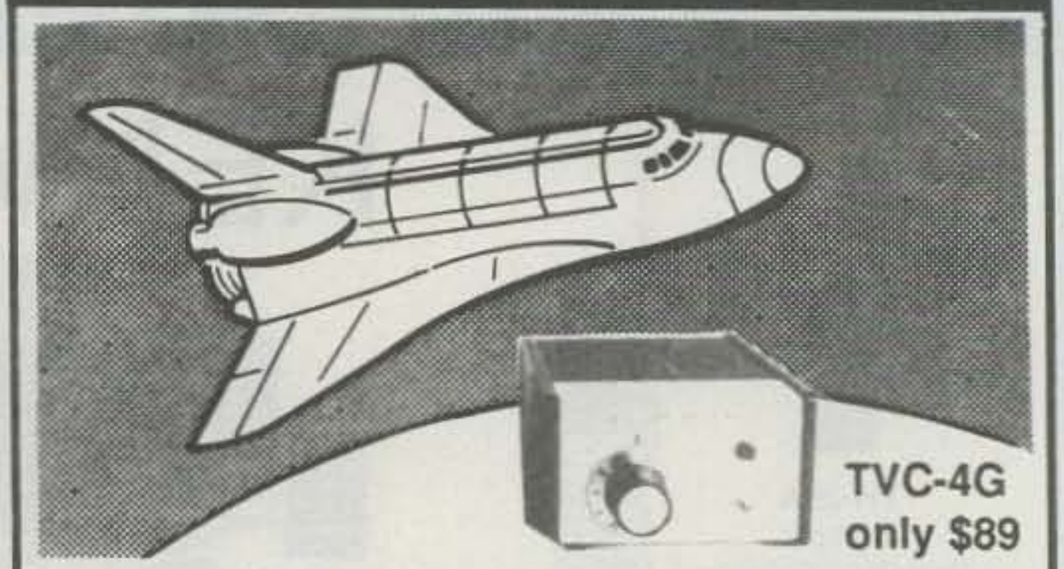

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2. The applicant completes the (FCC Form 756) application, attaches the original PPC and other credit documents, and sends the paperwork to the FCC in Gettysburg, Pennsylvania. The FCC said that a COLEM could act as the filing agent for the applicant, however, and the National Radio Examiners Division of the W5YI Group intends to do just that. This will permit us to screen all Commercial Radio Operator applications and related paperwork before submission to the FCC.

The "other credit documents" are either a commercial or amateur radio operator license, or both. Amateur Extra Class operators receive credit for the telegraphy portion of the 2nd Class Radiotelegraph Operator Certificate. Thus, for example, an Extra Class Amateur Operator holding a MROP (Marine Radio Operator Permit) would only have to be administered Commercial Radio test Elements 5 and 6 to qualify for a Commercial 2nd Class Radiotelegraph Certificate. Copies of the MROP and Amateur Extra class licenses would have to be attached to the application along with the appropriate PCC(s) covering Element 5 and 6.

Commercial Radio Written Test Elements

Element 1: (Formerly Elements 1 and 2.) Covers basic radio law and operating practice with which every maritime radio operator should be familiar (24 multiple-choice questions; minimum correct to pass: 18 questions answered correctly). Element 1 is the sole requirement for the MROP (Marine Radio Operator Permit) and a partial requirement for the GROL (General Radio Operator License), all radiotelegraph operator certificates, and both GMDSS licenses. The question pool contains a total of 170 questions.

Element 3: General Radiotelephone. Covers electronic fundamentals and techniques required to adjust, repair, and maintain transmitters and receivers at stations licensed by the FCC in the aviation, maritime, and international fixed public radio services. There are 729 potential questions in the pool and 76 questions in the exam. Pass rate: 57 correct.

Element 5: Radiotelegraph operating practice. Covers radiotelegraphy operating procedures and practices generally followed or required in other than in the Maritime Mobile Services of public correspondence. (50 questions; pass: 38.)

Element 6: Advanced radiotelegraph. Covers technical, legal, and other radiotelegraph matters including operating procedures and practices in the Maritime Mobile Services of public correspondence. (100 questions; pass: 75.)

Element 7: GMDSS Operator (Global Maritime Distress and Safety System). Covers new satellite-based emergency

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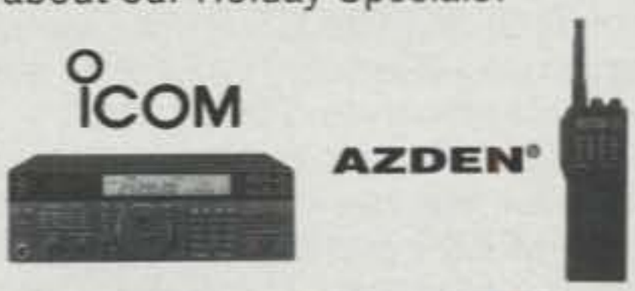

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system due to be implemented next year, which will replace manual telegraphy. Includes GMDSS operating procedures and practices, regulations, and equipment knowledge. (76 questions; pass: 57.)

Element 8: Ship Radar Techniques. Covers proper installation, servicing, and maintenance of ship radar equipment in general use for marine navigational purposes. (50 questions; pass: 38.)

Element 9: GMDSS Maintainer. Covers installation, repair, and maintenance of Global Maritime Distress and Safety System equipment. (50 questions; pass: 38.)

Commercial Radio Telegraphy Test Elements

These examinations prove international Morse code proficiency at certain speeds using all letters of the alphabet, numerals 0–9, period, comma, question mark, slant mark, and prosigns (*AR, BT,* and *SK*). Each examination must include every character at least once. The *only acceptable answer format* is transcribing one minute solid copy without an error.

All numerals, punctuation, and prosigns count as two characters. No hand sending test is required, although it could be required by the examiners. The FCC said "Passing a telegraphy receiving examination is adequate proof of an examinee's ability to both send and receive telegraphy."

Telegraphy Element 1: 16 code groups per minute (random characters). Pass: 80 consecutive characters.

Telegraphy Element 2: 20 plain-language words per minute. Pass: 100 consecutive characters.

Telegraphy Element 3: 20 code groups per minute. Pass: 100 consecutive characters.

Telegraphy Element 4: 25 plain-language words per minute. Pass: 125 consecutive characters.

Privatized Testing Is Already Underway!

The question pools for written Elements 1 and 3 were released by the FCC during early September 1993. Written Elements 5 and 6 required for the telegraph licenses are scheduled for release during November 1993. The balance of the question pools, however, will not be released until next year. The Ship Radar Endorsement (Element 8) question pool is planned for April 1994. The GMDSS Radio Maintainer (Element 9) and GMDSS Radio Operator question pool (Element 7) will not be available until February and May 1994.

The COLEMs were authorized to begin testing for the Marine Radio Operator Permit (MROP) and the General Radiotelephone Operator License as (GROL) soon as the Element 1 and 3 question pools were available and their examiners were trained. The National Radio Examiners division of the W5YI Group is already lining up test centers and conducting examinations across the country.

Each COLEM must maintain and submit an annual record of expenses and revenues for the prior calendar year to the FCC's Personal Radio Branch. A quarterly report must also be submitted on January 15, April 15, July 15, and October 15 indicating the number of examination sessions, number of examinees, and number of each element administered and passed.

Each of the nine COLEMs has submitted its own test fee schedule, and these schedules have been approved by the FCC. A COLEM may not increase test fees without FCC approval, although exam fees may be reduced at any time. The National Radio Examiners division of the W5YI Group said it would be charging $35 per license, which is the same as previously charged by the FCC ($15 of the $35 test fee is shared with each of its more than 200 COLE Test Centers located across the nation).

Other FCC Presentations

Bill Cross, program analyst in the FCC's (Washington, DC) Personal Radio Bureau, gave a presentation to the COLEMs on the procedures they should follow when administering Commercial Radio Operator License exams. The functions of a COLEM and their examiners are:

Announcing examination sessions: Test sessions may be at any specified time or location.

Verifying identity of examinee: Examiners must make positive identification through picture ID and signature verification.

Preparing question sets and telegraphy messages: Examiners must follow proper formula for constructing all written and telegraphy examinations. Testing materials may be obtained from another COLEM or supplier.

Administering question sets and telegraphy messages: Examiners are to assist applicants in determining which elements are needed to qualify for a specific Commercial Radio Operator license. Time limit for tests is determined by the examiner. (The Field Operation Bureau said a testing duration of one to three hours was reasonable, depending on the exam element.) Examinees may not leave room. The same question set or telegraphy message may not be re-administered to same person. There is no requirement that all test elements required for a Commercial Radio Operator License be administered by the same COLEM or examiner.

Accommodating the handicapped: Examiners may demand a physician's certification. Oral examinations (except for

Element	Exam	Pass	Size/Pool
1	24	18	170
3	76	57	729
5	50	38	*
6	100	75	*
7	76	57	*
8	50	38	*
9	50	38	*

Table I– Examination element requirements for each operator license.

Table II– Breakdown of subelements in Commercial Radio Operator examination Element 3.

Subelement:	Questions in Pool	Questions in Exam
3A Operating Procedures	41	5
3B Radio Wave Propagation	22	4
3C Radio Practice	97	5
3D Electrical Principles	115	16
3E Circuit Components	75	12
3F Practical Circuits	139	20
3G Signals and Emissions	97	9
3H Antennas and Feed Lines	143	5
Total Element 3	**729**	**76**

	Examination Element No.										
License	**1**	**3**	**5**	**6**	**7**	**8**	**9**	**T1**	**T2**	**T3**	**T4**
MROP	1	—	—	—	—	—	—	—	—	—	—
GROL	1	3	—	—	—	—	—	—	—	—	—
GMDSS/O	1	—	—	—	7	—	—	—	—	—	—
GMDSS/M	1	3	—	—	—	—	9	—	—	—	—
RADAR	—	—	—	—	—	8	—	—	—	—	—
3rd R/T	1	—	5	—	—	—	—	T1	T2	—	—
2nd R/T	1	—	5	6	—	—	—	T1	T2	—	—
1st R/T	1	—	5	6	—	—	—	—	—	T3	T4

(Note: MROP = Marine Radio Operator Permit, GROL = General Radiotelephone Operator License, GMDSS/O = Global Maritime Distress and Safety Service Operator's License, GMDSS/M = Global Maritime Distress and Safety System Maintainer's License, RADAR = Ship Radar Endorsement, 3rd/2nd/1st R/T = Third/Second/First Class Radiotelegraph Operator's Certificate.)

Table III- Test elements required for Commercial Radio Operator licenses.

the blind §13.209[i]) and testing in foreign languages are not allowed. Proficiency in English is required on all examinations. Test questions may be read to the blind. The FCC said that the same telegraphy accommodations used in the Amateur Service may be used in Commercial examinations. These include: *where warranted* using flashing lights, vibrating surfaces, adjusting tone frequencies and volume, pausing the telegraphy message at intervals to obtain a response from the applicant, or substituting a sending test for a receiving exam. (Each COLEM was given a copy of the VEC's handicapped telegraphy instructions.) Uncorrected physical handicaps may result in a restrictive endorsement being placed on the operator's license. The restriction may allow equipment installation, service, and

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Maintaining examination integrity: Examiners should be alert to any items which could compromise an exam, such as a crib sheet, pre-programmed calculator and other memory devices. Also prohibit items that could distract examinees. Applicants needing to go to the rest room should be accompanied by an examiner.

Answer post-examination questions: Examiners should be aware of Part 13 Rules and FCC/COLEM instructions.

Submit quarterly/annual reports to the FCC: These reports on testing and revenue/expenses go to the FCC's Personal Radio Branch in Washington, DC.

The Question Pools

George Dillon is the Chief of the FCC's Aviation and Marine Branch. He also is in charge of all Commercial Radio Operator examination question pools—a Question Pool Committee of one, so to speak. While there will eventually be seven question pools, only the Element 1 and 3 pool will be released at first. This will permit the COLEMs to begin testing for the Marine Radio Operator Permit and the General Radiotelephone Operator License which are, by far, the most popular.

The Element 1 and 3 pools were sent to each COLEM and released to the public on September 3. Dillon said that he needed additional questions to be submitted on all other elements.

Table I lists the written examination Elements, number of questions on the exam, the number correct needed to pass, and the size of the pool (* = question pool not yet completed). Element 3 is broken down into eight sub-elements that are identical to those in the amateur pools (see Table II). Table III contains a list of the test elements for which an examination is required in order to qualify for a Commercial Radio Operator license.

Examination Integrity

Monty Depont, Senior Attorney in the FCC's Personal Radio Branch, discussed the importance of maintaining high standards. Examiners are required to carefully safeguard exam materials against unauthorized disclosure, and all question sets and telegraphy messages should be changed frequently. The rules (Part §13.209[c]) specify that "Neither the same telegraphy message nor the same question set may be re-administered to the same examinee."

Depont emphasized two areas that were particularly susceptible to fraud. He said:

1. Steps must be taken to prevent one applicant from taking examinations for another person. It is the responsibility of the examiner to positively identify each examinee with documentary proof.

2. The PPC (Proof of Passing Certificate) is the most vulnerable aspect of the COLE system. They must be counterfeit and alteration proof. All PPCs are required to contain a serial number and be strictly accounted for.

All COLEMs and examiners are required to keep a database record of the:

(a) Legal name of every applicant: last, first, middle initiall.
(b) Their current mailing address.
(c) Date of birth: Month, Day, Year.
(d) Examination element(s) passed.
(e) Date element(s) passed.
(f) PPC serial numbers issued.

COLEMs were directed to immediately report all instances of cheating to the Personal Radio Branch in Washington, DC.

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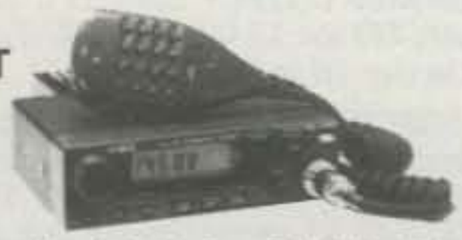
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Filling Out The Application Form

Larry Weikert, an official in the Special Services Branch at the FCC's Gettysburg, Pennsylvania licensing facility, discussed the proper completion of the Commercial Radio Operator License Application (FCC Form 756). This form is in the process of being revised and should be available next month. In the meantime, all COLEMs will use the current Form 756, which carries an expiration date of October 31, 1993.

At present a new Commercial Radio Operator license does not carry a "processing fee"—only the COLEM's "examination fee." Renewals and requests for duplicate licenses must be handled by the applicant and carry a $35.00 filing fee.

Weikert said the turnaround time between Commercial Radio Operator application receipt and license issuance was running around six to eight weeks. He said he hoped to reduce this to four to six weeks, and eventually to two to three weeks.

The FCC said it hopes to charge a $35 "application processing fee" sometime in the future. "The recent legislation did not specify an application processing fee for commercial operator licenses." When such a fee is authorized by Congress, it will be in addition to the present examination fee. (In the case of National Radio Examiners, the total would then increase to $70 per license—$35 examining fee plus $35 application processing fee.)

The FCC is also looking into the electronic filing of Commercial Radio Operator licenses, and invited COLEMs to contact the Gettysburg licensing facility if they are interested in participating in this project. The FCC also said that COLEMs could enter into agreements to provide examinations at schools, but that the COLEM was still responsible and accountable for the integrity of the exam.

Question Pools

There is no FCC requirement that COLEMs or examiners provide printed copies of the question pools to applicants. The decision as to which additional services will be offered and their cost is left up to the each COLEM. The FCC also said that COLEMs are free to provide a study guide containing answer explanations to the public. "They may not, however, require the applicants to take such services as part of an 'examination package.'"

National Radio Examiners will be printing and distributing all question pools as well as study material to the public. The Element 1 and 3 question pools have been printed into a single booklet and are now available for $10 from: N.R.E., P.O. Box 565206, Dallas, Texas 75356 (817-461-6443).

The COLEM Conference concluded with a Friday morning tour of the FCC's Gettysburg, Pennsylvania licensing facility and a general discussion period hosted by Gary Sanford, Chief of the Licensing Division and Bob McNamara, Chief of the FCC's Washington, DC Special Services Division.

A Special Note To Amateur Operators!

Want to get your Commercial Radio Operator license? Now is your chance. While it is not generally known, many of the questions in the General Radiotelephone Operator License (GROL) examination are taken verbatim from the Amateur Advanced and Amateur Extra Class question pools. We have been told that those questions will remain in the pool at least through the beginning of summer 1994, and possibly beyond.

Also, if you hold either a Commercial Radio Operator (GROL or 1st/2nd Radiotelegraph) or an Amateur Extra Class operator license and wish to establish a Commercial Radio Operator Test Center, let us know. We still have many major cities still available. Test centers are especially needed in cities with major airports and along marine coastlines. We also have a special program available for technical schools who wish to examine their own students. Contact National Radio Examiners at 817-461-6443, or write to us at P.O. Box 565206, Dallas, Texas 75356.

Until next month . . . 73, Fred, W5YI

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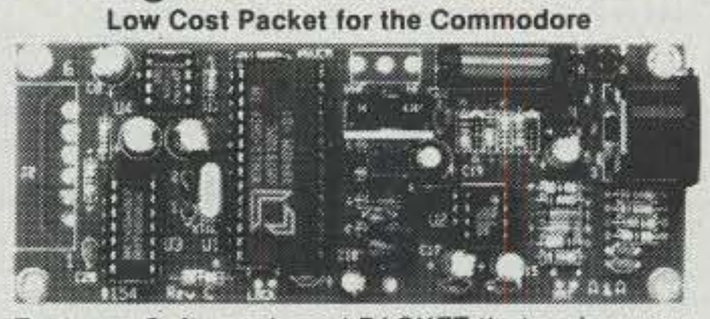

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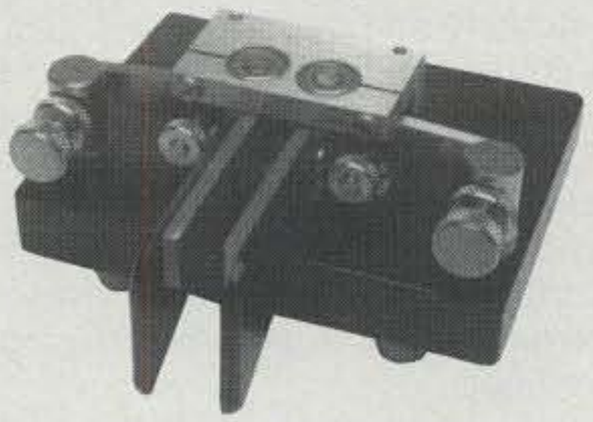

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PROPAGATION

BY GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

CQ WW DX CW Contest Special

The CW weekend of the 1993 CQ WW DX Contest will take place on November 27–28. Special DX Propagation Charts for use during both the Phone and CW weekends appeared in last month's column, along with valuable tips and suggestions for increasing scores. Be sure to refer to last month's column if you plan to participate in the WW CW Contest weekend. Additional tips will be discussed in this month's column.

Sunspot Cycle Progress

The 1993 CQ WW DX CW Contest will be held during a period of steadily declining sunspot activity.

The Royal Observatory of Belgium reports a monthly mean sunspot number of 57.3 for July 1993. This results in a 12-month running smoothed sunspot number, upon which the cycle is based, of 71.3 centered on January 1993. This is a drop of 2 points from the previous month's level. If the cycle continues its present rate of decline, a smoothed sunspot number in the low 50s can be expected for November 1993.

Solar activity during November 1993 is expected to be on the order of 20 points less than the 74 level observed last November. A level in the low 50s, however, is still considered to be an indication of relatively moderate solar activity. The last CQ World-Wide DX Contests held under similar sunspot conditions took place in 1983 and 1987.

While this year's CW Contest period will probably not break any records, solar activity is expected to be high enough for 1993 to be another good contest year, as long as nature doesn't pull a surprise radio storm to mar conditions.

A corresponding 10.7 cm mean solar flux level of 100 was reported for July by the Dominion Radio Astrophysical Observatory at Penticton, BC. This results in a smoothed solar flux value of 126 centered on January 1993. A smoothed level of approximately 120 is expected during this November.

Contest Tips

Last month's column contained special DX Propagation Charts for use during the CW section of the contest. If you plan to participate in the contest, be sure to check last month's column for propagation data that should be helpful in piling up contacts and points. For a day-to-day forecast of general propagation conditions expected during the month, including the contest weekend, see the Last Minute Forecast.

Here are some propagation rules of thumb that should be useful for working DX during November, and especially during the CW Contest weekend.

1. *During and shortly after sunrise*, excellent DX conditions to most areas of the world are forecast for 20 meters. Also check for openings on 40, 80, and 160 meters towards southerly and westerly directions.

2. From a few hours *after sunrise* until *late afternoon*, it should be a toss-up between 15 and 20 meters for the optimum DX band, with openings possible to many areas of the world during this period. Some openings should also be possible on 10 meters, but considerably below last year's level. Openings on these three bands should favor signals from an easterly direction before noon, from the north and south shortly after noon, and from southerly and westerly directions during the late afternoon hours.

3. During the *late afternoon* and *early evening* hours check 15 meters for signals arriving from the south and west, and 20 meters for signals from just about every direction. Fairly good DX openings towards the east and the south should also be possible on 40 meters beginning an hour or so before sundown.

4. During the *late evening* and *early morning* hours, 20 meters should open for DX towards the south, west, and northwest, often with strong signals. Good openings to most areas of the world should also be possible on 40 meters during the hours of darkness. Some fairly good 80 meter and some 160 meter DX

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LAST MINUTE FORECAST

Day-to-Day Conditions Expected for November 1993

Propagation Index.....	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 2-5, 14-15 23-24	A	A	B	C
High Normal: 1, 10, 12-13, 16, 20, 22, 25, 30	A	B	C	C-D
Low Normal: 3-4, 6, 11, 17, 19, 21, 27-29	A-B	B-C	D	D-E
Below Normal: 7, 9, 18	B-C	C-D	D-E	E
Disturbed: 8, 26	C-E	D-E	E	E

Where expected signal quality is: **A—Excellent opening, exceptionally strong, steady signals greater than S9.**

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S9 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.

2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any date of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good (B) on Nov. 1st, excellent (A) on the 2nd, fair (C) on the 3rd and 4th, excellent (A) on the 5th, etc. Fair conditions (C) are expected during the CQ World-Wide DX CW Contest weekend of Nov. 27–28.

Bulletin

Since this issue of *CQ* should reach most subscribers prior to the start of the CQ World-Wide DX SSB Contest weekend of October 30–31, here is an updated forecast made at press time for the general propagation conditions expected during the SSB weekend.

A moderate to severe radio storm occurred on September 3 and 4. According to the 27-day recurrence tendency for HF propagation conditions, there is a fairly high probability that this storm may recur two cycles later, on October 28 and 29th. Hopefully, if this should happen, the storm should subside by the beginning of the WW Phone Contest weekend of October 30th. Right now it looks like Below Normal conditions at the start of the contest, improving to Low Normal during the day. Expect further improvement on Sunday, the 31st, with conditions at least Low Normal, improving to High Normal at times. Check actual conditions on October 2 and 3, which would be just one 27-day cycle prior to the contest weekend, for a more probable recurrence pattern.

During the contest be sure to check with the forecast sources discussed in last month's column for up-to-the minute reports on ionospheric conditions.

The initial forecast for the CW Contest weekend of November 27–28 looks fairly good at this time. Low Normal conditions are expected for the entire weekend.

A fine-tuned press-time update for the CW Contest weekend will appear as a bulletin in next month's column.

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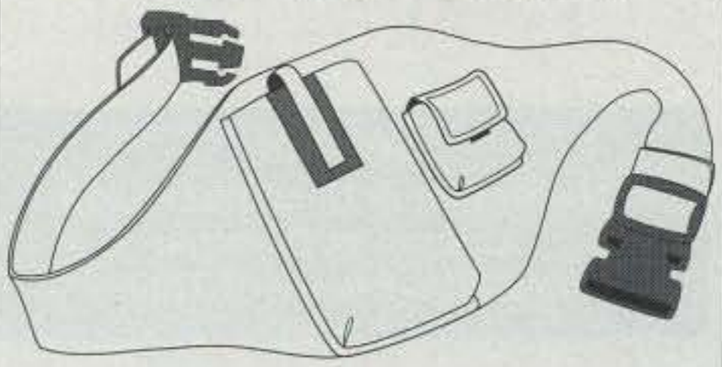

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HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular meter band (10 through 160 meters) as shown in the left-hand column of the chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate meter band column (15 through 80 meters) for a particular geographical region of the continental USA as shown in the left-hand column of the charts. An * indicates the best time to listen for 80 meter openings.

2. The propagation index is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parentheses, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of days during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

3. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 AM; 13 is 1 PM, etc. On the Short-Skip Chart appropriate *standard* time is used at the path midpoint. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between New York and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones add 2 hours in the PST zone; 3 hours in the MST zone; 4 hours in the CST zone; and 5 hours in the EST zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 PM in Los Angeles; 17 or 5 PM in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA subtract 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone; and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 PM in New York City.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts CW or 300 watts PEP on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts CW or 1 kw PEP on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the propagation index will increase by one level; for each 10 dB loss, it will lower by one level.

5. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado 80302.

CQ Short-Skip Propagation Chart
November & December 1993
Local Standard Time
At Path Midpoint (24-Hour Time)

Band (Meters)	Distance between stations (Miles) 50-250	250-750	750-1300	1300-2300
10	*Nil*	*Nil*	08-11 (0-1) 11-17 (0-2) 15-17 (0-1)	08-09 (1) 09-11 (1-2) 11-15 (2) 15-17 (1) 17-19 (0-1)
15	*Nil*	09-11 (0-1) 11-15 (0-2) 15-18 (0-1)	07-08 (0-1) 08-09 (0-2) 09-11 (1-3) 11-15 (2-4) 15-16 (1-3) 16-18 (1-2) 18-19 (0-1)	07-08 (1) 08-09 (2) 09-11 (3) 11-15 (4) 15-16 (3) 16-18 (2-3) 18-19 (1-2) 19-21 (0-1)
20	10-12 (0-1) 12-14 (0-2) 14-16 (0-1)	06-07 (0-1) 07-10 (0-2) 10-12 (1-3) 12-14 (2-4) 14-16 (1-4) 16-17 (0-3) 17-19 (0-2) 19-22 (0-1)	06-07 (1) 07-09 (2-3) 09-10 (2-4) 10-12 (3-4) 12-16 (4) 16-17 (3-4) 17-19 (2-3) 19-22 (1-2) 22-00 (0-1)	06-07 (1-2) 07-09 (3) 09-15 (4-3) 15-17 (4) 17-19 (3-4) 19 21 (2-3) 21-22 (2) 22-23 (1-2) 23-00 (1) 00-06 (0-1)
40	07-08 (0-2) 08-09 (1-3) 09-17 (3-4) 17-19 (2-3) 19-21 (1) 21-00 (0-1)	06-07 (0-2) 07-08 (2-3) 08-09 (3) 09-15 (4-3) 15-17 (4) 17-19 (3-4) 19-21 (1-3) 21-00 (1-2) 00-03 (0-2) 03-06 (0-1)	06-07 (2-3) 07-08 (3) 08-09 (3-2) 09-15 (3-1) 15-17 (4-2) 17-19 (4) 19-21 (3-4) 21-03 (2-4) 03-06 (1-3)	06-08 (3-2) 08-09 (2-1) 09-15 (1-0) 15-17 (2-0) 17-19 (4-3) 19-03 (4) 03-06 (3)
80	08-21 (4) 21-01 (3-4) 01-04 (2-3) 04-07 (1-2) 07-08 (3)	08-09 (4-2) 09-16 (4-1) 16-18 (4-3) 18-01 (4) 01-04 (3-4) 04-07 (2-3) 07-08 (3)	08-09 (2-1) 09-16 (1-0) 16-18 (3-1) 18-20 (4-3) 20-04 (4) 04-06 (3-4) 06-07 (3) 07-08 (3-1)	08-09 (1-0) 09-16 (0) 16-18 (1-0) 18-20 (3-2) 20-04 (4) 04-06 (4-2) 06-07 (3-1) 07-08 (1)
160	07-09 (3-2) 09-11 (2-0) 11-17 (1-0) 17-19 (3-2) 19-07 (4)	07-09 (2-1) 09-17 (0) 17-19 (2-1) 19-04 (4) 04-07 (4-2)	07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-21 (4-2) 21-04 (4) 04-06 (2) 06-07 (2-1)	07-19 (0) 19-21 (2-1) 21-04 (4-2) 04-06 (2-1) 06-07 (1-0)

openings are also possible during this period.

Signal levels on most DX openings should be noticeably stronger during November as a result of a seasonal decrease in static levels and solar absorption.

CW Contest Work Plan

The accompanying sample work chart for the CW Contest section was devised from the DX Propagation Charts which appeared in last month's column. This particular example is for multi-band operation and for a PST zone QTH. Similar work charts can be devised for other bands, for other operating conditions, and for other time zones.

VHF Ionospheric Openings

Two significant meteor showers are expected during November, which should make possible some meteor-scatter-type openings on the VHF bands. The *Taurids* shower is scheduled to occur between

HAWAII
November & December 1993
Openings Given in
Hawaiian Standard Time

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80* Meters*
Eastern USA	08-10 (1) 10-12 (2) 12-14 (1)	07-08 (1) 08-12 (2) 12-14 (3) 14-15 (2) 15-17 (1)	06-08 (2) 08-13 (1) 13-14 (2) 14-17 (3) 17-20 (2) 20-00 (1)	16-18 (1) 18-02 (3) 02-04 (1) 18-20 (1)* 20-01 (2) 01-03 (1)*
Central USA	08-10 (1) 10-14 (2) 14-16 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-07 (2) 07-08 (3) 08-13 (2) 13-14 (3) 14-16 (4) 16-18 (3) 18-20 (2) 20-00 (1)	17-19 (1) 19-20 (2) 20-02 (3) 02-03 (2) 03-04 (1) 19-21 (1)* 21-02 (2)* 02-04 (1)*
Western USA	08-10 (1) 10-14 (2) 14-17 (1)	06-07 (1) 07-08 (2) 08-12 (3) 12-14 (4) 14-16 (3) 16-17 (2) 17-19 (1)	06-07 (2) 07-09 (4) 09-14 (3) 14-16 (4) 16-18 (3) 18-22 (2) 22-02 (1)	17-18 (1) 18-20 (2) 20-01 (4) 01-04 (3) 04-06 (2) 06-07 (1) 18-19 (1)* 19-21 (2)* 21-04 (3)* 04-05 (2)* 05-06 (1)*

Time PST	Time UTC	Areas To Which Openings Should Be Optimum *
Mid–2 AM	08–10	Australia, S. America, Antarctica
2–4 AM	10–12	S. Pacific, New Zealand, Australia
4–6 AM	12–14	Australia, Central & South America
6–8 AM	14–16	Europe, N. Africa, Central & South Asia, S.E. Asia, Far East, S. Pacific, New Zealand, Australia, Antarctica, North & Central South America
8–10 AM	16–18	Europe, Mediterranean, Middle East, S.E. Asia, Far East, S. Pacific, New Zealand, Australia, Central and South America
10 AM–Noon	18–20	Western and Southern Europe, Africa, Far East, S. Pacific, New Zealand, North & Central South America
Noon–2 PM	20–22	Western & Southern Europe, Africa, Australia, North & Central South America
2–4 PM	22–00	Western & Central Europe, Mediterranean & Miiddle East, Africa, Central & South America
4–6 PM	00–02	Africa, S. Pacific, New Zealand, Far East, Central & South America
6–8 PM	02–04	Africa, Central & South Asia, S.E. Asia, Far East, S. Pacific, New Zealand, Australia, Antarctica, Central & South America
8–10 PM	04–06	Far East, S. Pacific, New Zealand, Australia, Central & South America, Antarctica
10 PM–Mid	06–08	S. Pacific, New Zealand, Australia, Central & South America, Antarctica

** Based upon a propagation index of (2) or higher.*

Table I– Sample 20 meter operating schedule for Western QTH, derived from DX Propagation Charts appearing in last month's column. Similar schedules can be derived for other bands, multi-band operation, time spans, and for other propagation indices.

November 2 and 4, peaking during the early morning hours of the 3rd with a rate of about 15 meteors per hour. Later in the month the *Leonids* shower should take place. This shower will peak on the 15th, but its effect should be noticeable from the 14th through the 16th. During the peak of the *Leonids* shower about 15 meteors should enter the earth's atmosphere each hour.

Auroral-type VHF ionospheric openings are likely to occur during the month, especially when ionospheric conditions on the HF bands are Below Normal or Disturbed. Check the Last Minute Forecast at the beginning of this column for the days that are most likely to be in these categories during November.

Solar activity is too low to expect any regular 6 meter F-2 ionospheric openings. There is a possibility, however, although very slim, for an occasional 6 meter Trans-Equatorial (TE) scatter-type opening during November, mainly between the southern tier states and deep South America. If a TE opening is to occur at all, the most likely hours are between 8 and 11 PM local standard time.

This month's column contains short-skip propagation data for use between distances of approximately 50 and 2300 miles, and between the states of Hawaii and Alaska and the continental areas of the United States.

Good luck on the WW DX CW Contest weekend. Be sure to let me know how these special contest propagation forecasts work out. For the past 33 years the contest forecasts have held up with an accuracy better than 90%.

73, George, W3ASK

ALASKA
Openings Given in GMT

To:	10 Meters	15 Meters	20 Meters	40/80* Meters
Eastern USA	19-22 (1)	16-18 (1) 18-21 (2) 21-23 (3) 23-00 (2) 00-01 (1)	18-21 (1) 21-23 (2) 23-01 (3) 01-02 (2) 02-04 (1)	06-12 (1) 07-11 (1)*
Central USA	19-23 (1)	17-18 (1) 18-21 (2) 21-00 (3) 00-01 (2) 00-01 (2) 01-02 (1)	17-20 (1) 20-23 (2) 23-02 (3) 02-03 (2) 03-05 (1)	06-14 (1) 07-12 (1)*
Western USA	19-21 (1) 21-23 (2) 23-00 (1)	17-20 (1) 20-21 (2) 21-22 (3) 22-00 (4) 00-01 (3) 01-02 (2) 02-03 (1)	14-17 (1) 17-20 (2) 20-22 (3) 22-00 (4) 00-02 (3) 02-04 (2) 04-06 (1)	02-03 (1) 03-05 (2) 05-14 (3) 14-15 (2) 15-16 (1)

**Indicates best times to listen for 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.*
For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter openings.
For 30 meter openings interpolate between 40 and 20 meter openings.

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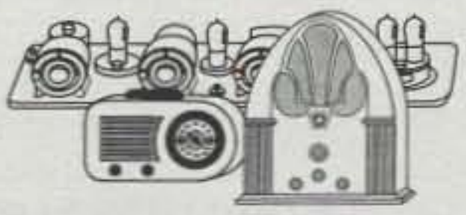

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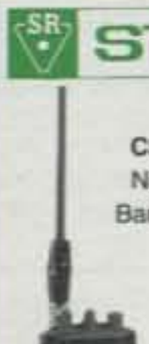

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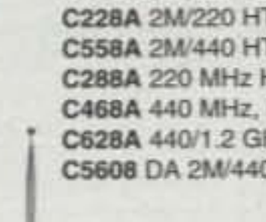

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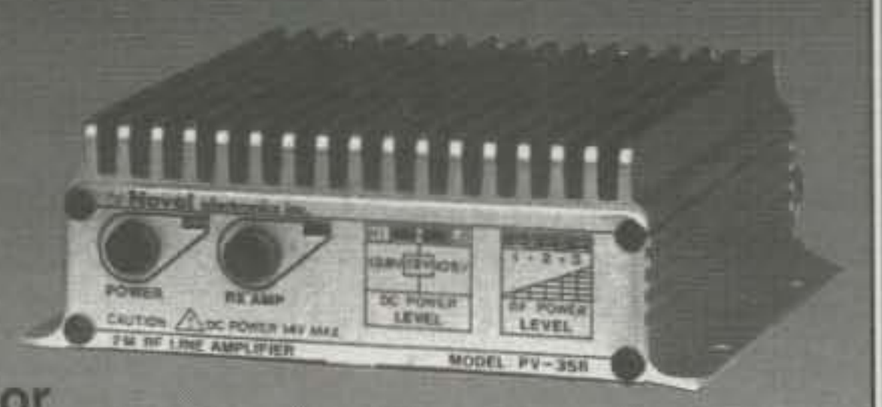

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TELEGRAPH: Keys, bugs, sounders, relays, and oddball W.U. Tel Co. equipment available for swap for keys or bugs. Dave Pennes, WA3LKN, 7410 Noel Road, Indianapolis, IN 46278-1516 (317-299-9307).

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WANTED: Old ham band transceivers or receivers of any type. Collins, Hammarlund, Hallicrafters, etc. If you have one and would like to sell it, please write KD4AJ, 1968 Huntington Hall Court, Atlanta, GA 30338. All inquiries will be answered.

WANTED: YAESU 901-902 standard (no scan) EXT VFO, mint condition with attachment cord and manual. Harry Hemrick, KC4FYC, 2784 Woodvale Drive, Winston-Salem, NC 27127, (919-785-9575).

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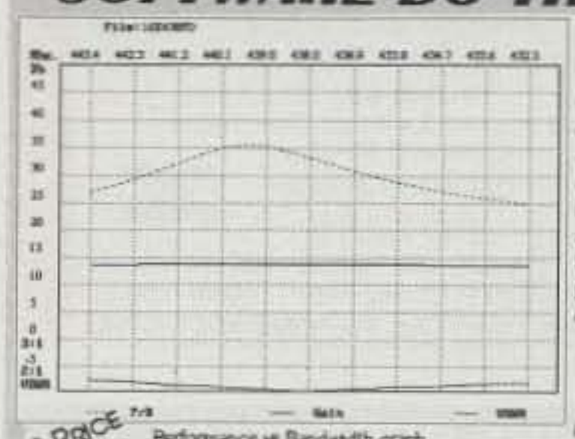

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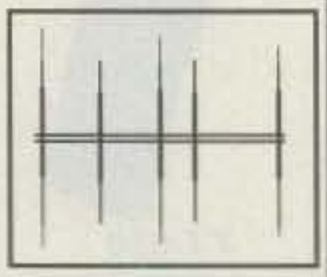

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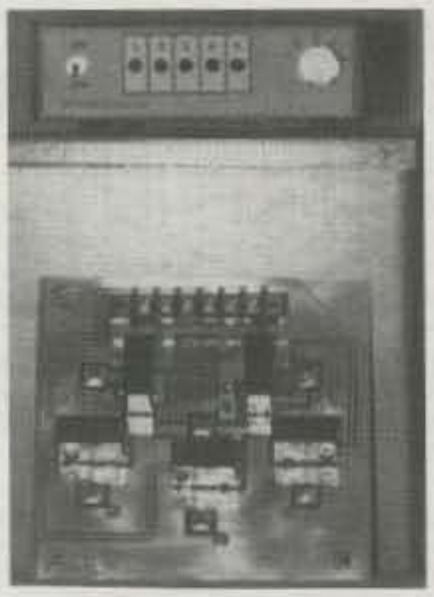

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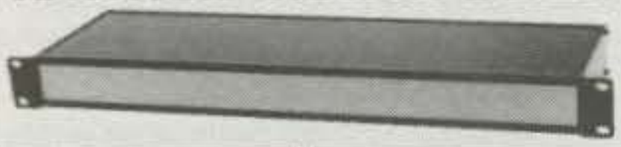
RACK AND CHASSIS BOXES



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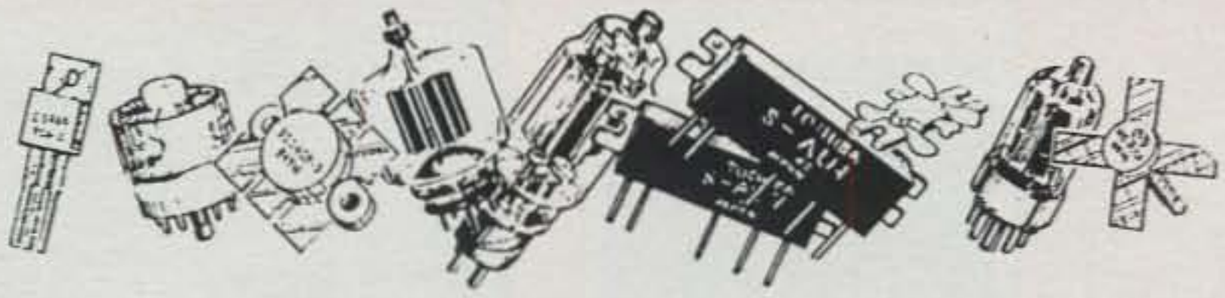

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10Hz - 3GHz. extremely High Sensitivity, High Resolution and Accuracy, includes Bargraph. ± 1ppm TCXO. Two Inputs, Trigger Variable and Hold Button **$579.**

Premium TXCO $135.
BLB Backlight Beeper $ 75.

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The R10 is a unique FM Communication Test Receiver with security and surveillance applications. The R10's full spectrum audio output interfaces directly with the DC440 to monitor CTCSS and DTMF, FM Deviation and Relative Signal Strength.

Optoelectronics Advantages
1. Decode & Display CTCSS, DTMF or DCS & DTMF simultaneously
2. 127 Character DTMF Buffer with scrollable 10 Character Display. No Lost Data
3. LCD Display, visible in bright Sunlight
4. Serial Computer Interface
5. *Activity indicator*—lets operator see when unit is actively decoding
6. High Quality NiCad Battery pack option
7. Actual DTMF Characters Displayed!

R10 $359.
DC440 $259.
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APS104

CF802

TC200

Save on Ant Paks

SSB220

Model APS104
Tunable band pass filter system Covers 10MHz to 1000MHz. Tunes continuously over more than 5 octaves and maintains a constant 4MHz band width.

Use with counter or R10 Interceptor to increase pick-up distance up to 10 times. Ultimate Security Sweeper. **$995.**

The Model CF802
835MHz ± 10MHz filter/amplifier for use with near field instruments such as the Model R10 Interceptor and Models 3000A and M1 HandiCounters® to extend the pick up distance by limiting the band width and adding amplification. The pick-up distance when using the CF802 with the Model 3000A or M1 will improve from 25 feet to over 200 feet. When used with a Model R10, the improvement will be from 75 feet to over 750 feet. **$149.**

TC200 Tone Counter
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Model SSB220
Directly measures the frequency of single sideband transmitters! The ideal instrument for precise net frequency control and a must for non-synthesized transceivers.
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- **Save that rig!**

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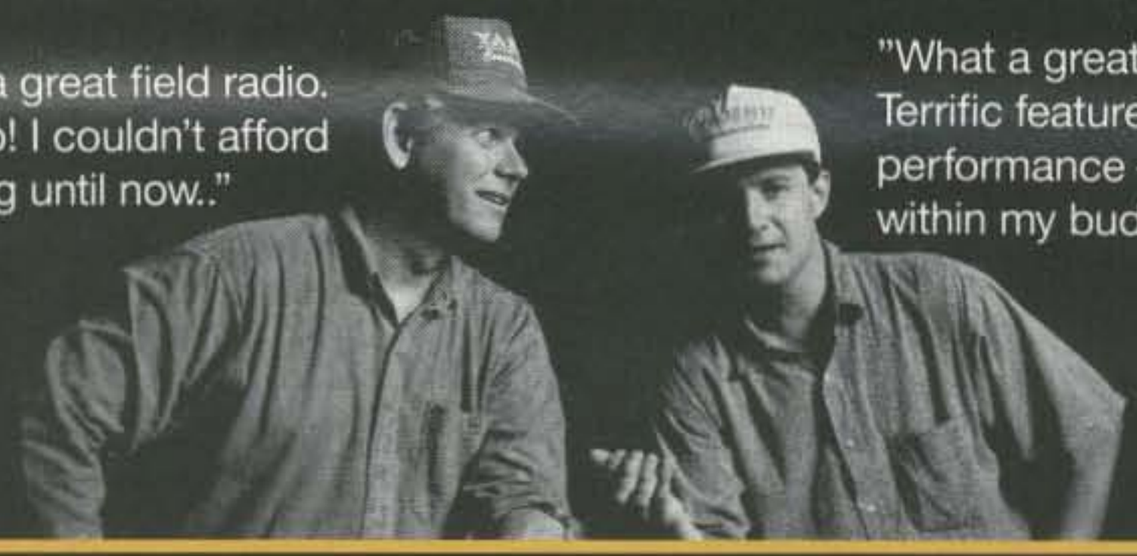

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FT-840
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- Direct Digital Synthesis (DDS)
- Frequency coverage:
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- IF Shift
- 100 Memory Channels (Independent TX/RX per memory)
- Twin Band Stacking VFOs
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- CW Reverse Feature
- Choice of Two Optional Antenna Tuners:
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* Optional

If you're trading up from an older rig, but have a budget, you want the most you can afford in top-notch HF. Then the FT-840 is for you. It's right on the money! Considering a mobile HF or field radio and doubt the quality and features of tiny HF rigs? Then the FT-840 is for you. It won't disappoint you!

Built to handle rigorous field operation, the new intense LCD display affords sharp visibility in bright sunlight. Die-cast heat sink and internal thermally switched fan keep the FT-840 running cool. Modular design circuit boards ensure operating efficiency – manufacturing excellence you'd expect in much higher priced radios.

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2m/70cm Handhelds

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  FNB-38 9.6V, 600 mAh Battery
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"Look, alphanumeric display and a 4.8V battery. Terrific!"

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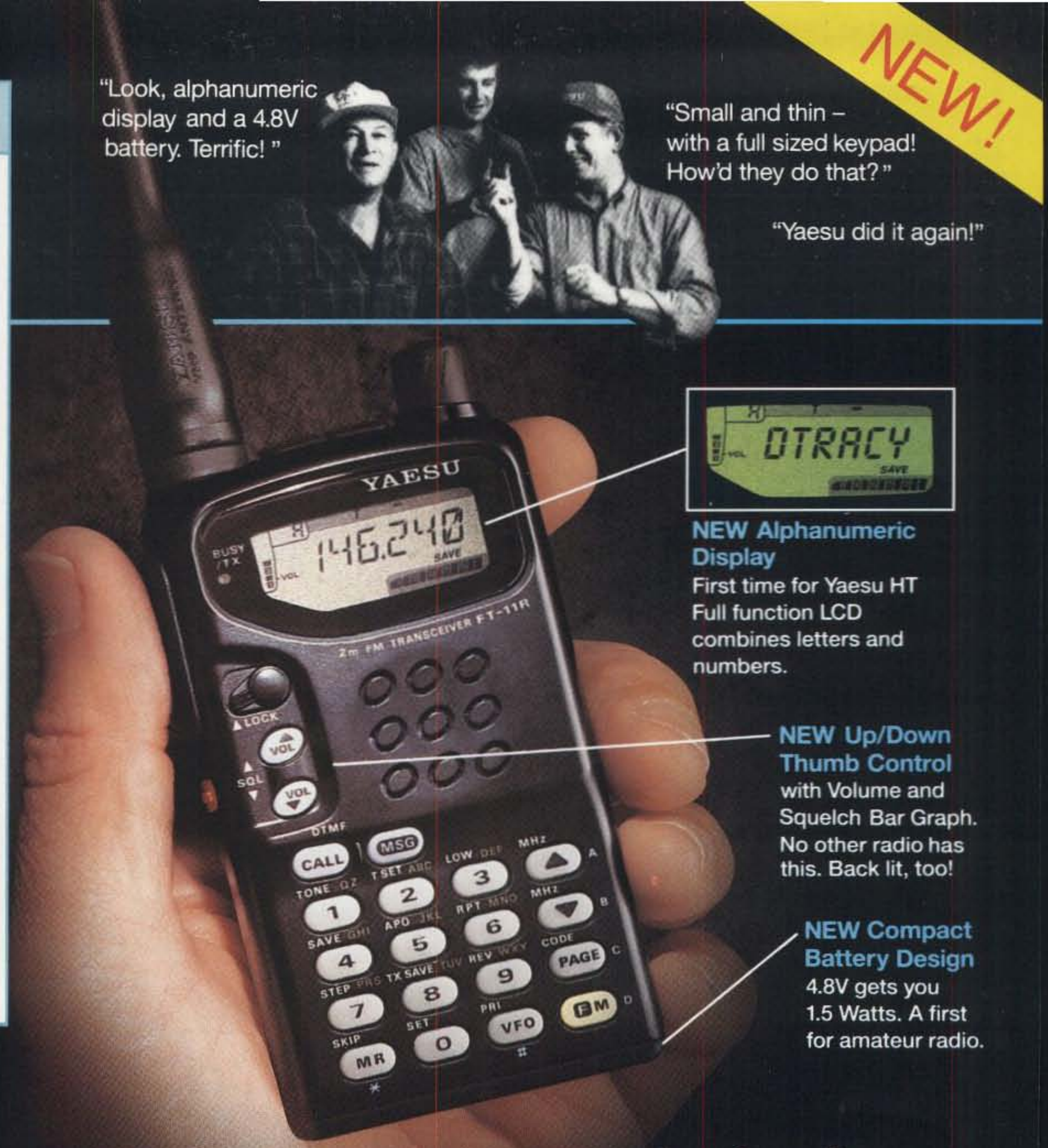

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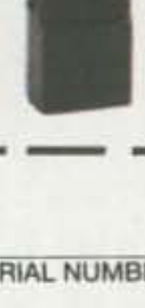

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